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PATHOLOGICAL AND CLINICAL
OBSERVATIONS

RESPECTING

MORBID CONDITIONS OF THE STOMACH.

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PATHOLOGICAL AND CLINICAL
OBSERVATIONS
RESPECTING
MORBID CONDITIONS OF THE STOMACH.

BY
C. HANDFIELD JONES, M.B., B.A. CANTAB., F.R.C.P., F.R.S.
ASSISTANT-PHYSICIAN TO ST. MARY'S HOSPITAL.



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MDCCCLV.

1574

TO
HENRY BENICE JONES, M.D. CANTAB., F.R.C.P., F.R.S.,
PHYSICIAN TO ST. GEORGE'S HOSPITAL,

IN ACKNOWLEDGMENT OF HIS BRILLIANT EXAMPLE,

AND

SCARCE LESS THAN BROTHERLY KINDNESS,

This Volume

IS GRATEFULLY DEDICATED BY HIS ATTACHED FRIEND,

THE AUTHOR.



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P R E F A C E.

THE occasion of this small work was the author's having been led to make a close examination of the morbid conditions of the stomach. As the inquiry was in some measure a new one, it is not surprising that it should have brought to light some facts with which we were before unacquainted. These have been in great part laid before the medical world in a paper "On Morbid Changes in the Mucous Membrane of the Stomach," published in the last volume of the Medico-Chirurgical Society's Transactions; but it appeared to the author that the results of this inquiry might be presented to his professional brethren in a more practical and acceptable form than was possible in a scientific communication. In attempting this he has sought to give an outline sketch of the principal heads of our knowledge of the subject. The first three chapters, he trusts, may be of some interest and profit to those, whose active duties forbid their devoting much time to the study of their science. The fourth, containing prin-

cipally the results of treatment, may perhaps afford some hints to those, whose stores of personal experience are not yet so ample as those of their elder brethren.

The author gratefully acknowledges the kindness of his colleagues at St. Mary's, in allowing him free access to the records of their Cases, and in assisting him in every way that lay in their power.

The admirable *post mortem* records kept at St. George's and St. Mary's have been of the greatest utility, and indeed, without them to refer to, the observations made must have lost much of their value.

Throughout the work the aim has been to regard disorders of the stomach, as far as possible, from the point of view afforded by the knowledge of pathological conditions, and to direct treatment with a special reference to the presumed morbid state.

The author has chosen the plan of illustrating points by giving separate cases in preference to the more succinct one of general descriptions; partly because this has been so well and so often done by others, and partly because the latter method has the advantage of impressing the facts more vividly on the memory.

The Council of the Medico-Chirurgical Society have, with great kindness and liberality, allowed the author to make use of the stones employed in prepar-

ing the plates, which accompanied his paper. To these several fresh figures have been added, and it is hoped that the whole will materially tend to elucidate the descriptions given in the text. The arrangement of the figures in the original plates was not in the author's hands, otherwise they would have been placed somewhat differently. The table of references according to subjects will, however, it is hoped, obviate any difficulty that might arise.

1, Southwick Place, Hyde Park,

Feb. 7th, 1855.

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Fig.

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Fig.

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 of sarcinæ. Fig. 24.

Fig 1



Fig 2

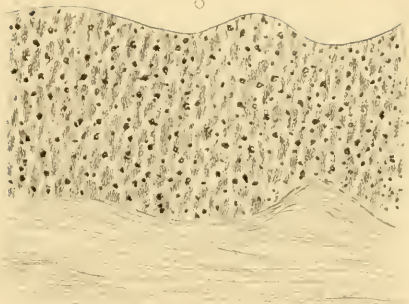


Fig 3.

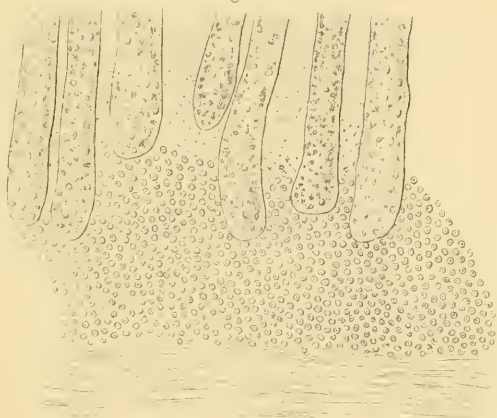


Fig 4.

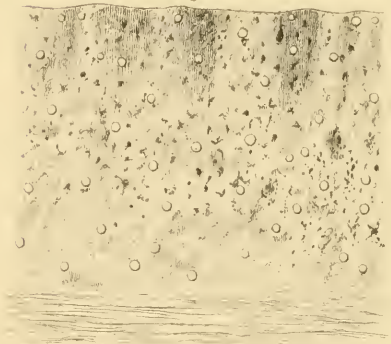


Fig 5

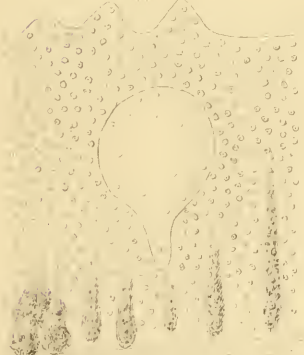


Fig 6

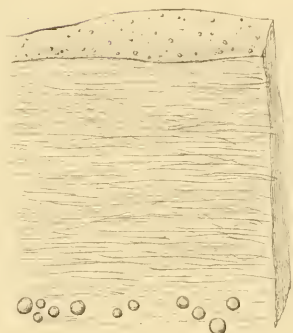


Fig 7

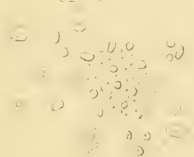


Fig 8



Fig 9



Fig 10

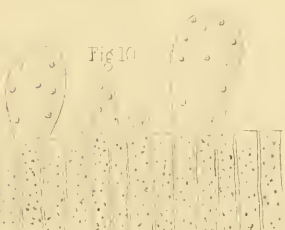
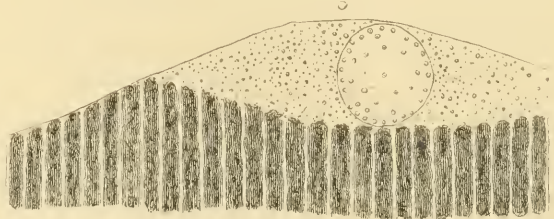


Fig 11.



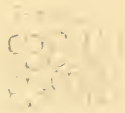
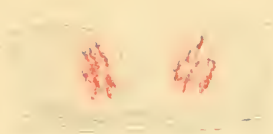
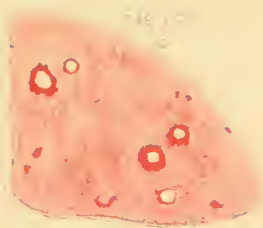
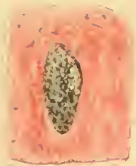
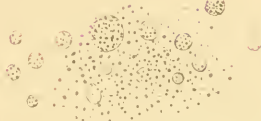


Fig 25



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Fig 28a



a



Fig 27

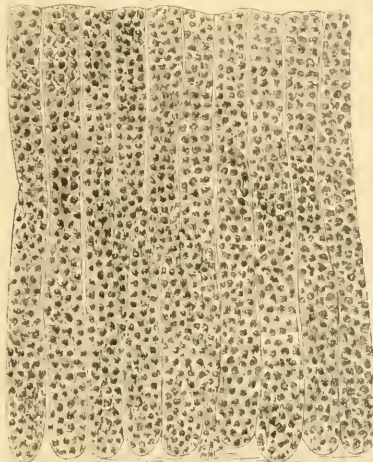


Fig 28

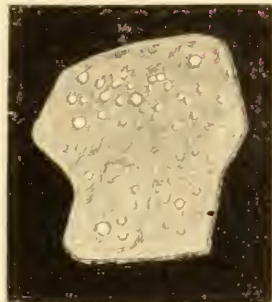


Fig 29

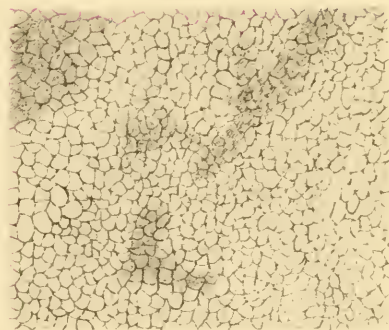
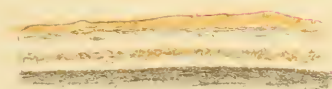
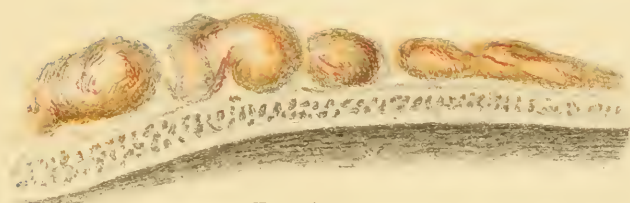


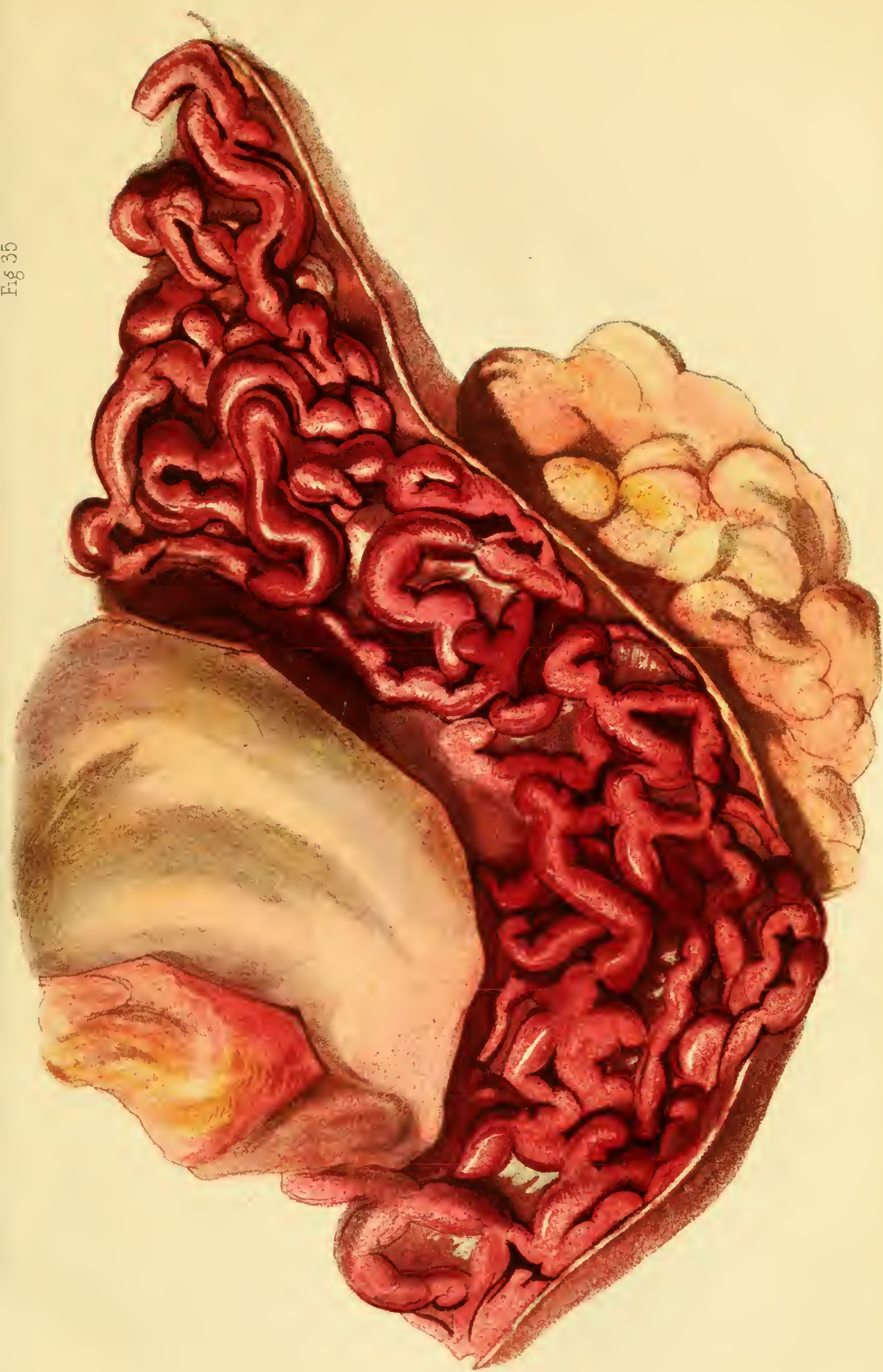
Fig 31



Fig 30







CHAPTER I.

ANATOMICAL DESCRIPTION OF THE STOMACH.

THIS organ is situate in the upper part of the abdomen, occupying the left hypochondrium and the epigastrium. Owing to the great variations in size, which it undergoes so frequently, it fills these regions more or less completely, or even advances into the adjoining.

The *form* of the stomach is peculiar, and not easy to describe very clearly. It may be regarded as resulting from the dilatation of the lower side of an obliquely placed tube, in such wise that it forms a large pouch to the left, and a considerable extension of the original cavity downwards, which gradually narrows towards the right. The upper orifice of the tube, the cardiac, marks the commencement of the left-hand pouch, which is widest where it joins the general cavity, and rather narrows as it extends upwards and to the left. Owing to this dilatation of the original digestive tube, which we have supposed, the stomach may be described as having an upper border, moderately concave, and known as the lesser curvature; a lower border, highly convex, known as the greater curvature, from its being very considerably longer than the lesser; an anterior face, and a posterior face, which are both ordinarily more or

less convex. The pouch developed to the left of the cardiac orifice varies, as Cruveilhier states, a good deal in size in different individuals. It must be remarked, that the form of the stomach depends very greatly on the degree of its distension. When no food has been taken for some days before death, and the muscular coat has retained its contractibility, the stomach is found so shrunk as to resemble almost a portion of intestine. Even in this case, however, the pouch on the left is distinctly protuberant. Occasionally, from some irregular contraction of the muscular coat, the stomach is remarkably constricted about its middle, so as to be partially divided into two cavities. In this state it is said to be affected by hour-glass contraction. Cruveilhier notices very correctly the existence of an ampullary dilatation, which is situated about two inches from the pylorus, in the great curvature, as well as a smaller one, which lies nearer to the pylorus, in the lesser curvature. Beyond and close to the lower dilatation is a circular constriction, which is succeeded by a sharp, elbow-like curve, the angle pointing forwards and to the right. This terminates at the circular constriction of the pylorus.

The general *direction* which the stomach takes in the adult, is transverse (in the foetus it is nearly vertical); its pyloric orifice is, however, lower, and in a plane somewhat anterior to the cardiac. The normal position of its axis may, however, be considerably altered by various causes, which have the general effect of lowering the pylorus, and bringing the organ into a more vertical direction. An enlarged condition of the liver, or lowering of its mass, traction from below, or compression of the abdomen, may have this effect.

It is very desirable to be well acquainted with the *relations* of the stomach to surrounding parts. These are admirably described by Cruveilhier, whose account agrees with some observations I have carefully made. The *anterior face* is covered to a greater or less extent by the left lobe of the liver, whose under surface rests upon it; more to the left it comes in contact with the under surface of the diaphragm, which separates it from the right ventricle of the heart and the base of the left lung. Below the level of the edge of the liver it is in relation with the peritoneum, lining the anterior wall of the abdomen. The extent of this relation depends very much on the degree of the stomach's distension. The cartilages of the sixth, seventh, eighth, ninth, and tenth ribs pass obliquely across and protect it, but are of course separated from it by the diaphragm. The seventh and eighth ribs themselves pass upwards and backwards across the anterior face. The *lower border* of the stomach is opposite the lower border of the cartilage of the ninth rib, and nearly opposite the umbilicus; it is in apposition with the transverse colon. This relation is of course very variable. The *upper border* gives attachment to the gastro-hepatic omentum, and is not in direct relation with anything else, except it be some lymphatic glands; the under surface of the left lobe of the liver lies at a little distance above it. The *posterior face* regards the vertebral column, the organs that lie in front of it, and extends also to the left, in front of the posterior attachments of the diaphragm, to the lower ribs. More particularly the posterior relations may be enumerated as the crura of the diaphragm, crossed transversely by the pancreas and the tortuous splenic

artery, above which, in the opening formed by the divergence of the crura, lie the aorta, vena azygos major, and thoracic duct : below the pancreas, the superior mesenteric artery and vein, the inferior mesenteric vein, the left renal artery and vein, the transverse portion of the duodenum, all covered by the transverse mesocolon, may be in relation, more or less immediate, with the posterior surface of the stomach. The posterior surface of the great cul-de-sac, if the stomach is at all distended, rests upon the upper part of the left kidney and the supra-renal capsule. To the right of the crus of the diaphragm, the posterior surface of the stomach regards the vena cava inferior, more or less covered by the lobulus spigelii, and somewhat more to the right the vessels which enter the transverse fissure of the liver. Immediately beyond this point we arrive at the pylorus. The highest point of the cul-de-sac of the stomach is about on a level with the lower edge of the angle of the sixth costal cartilage, just before it joins the rib ; but in this relation there is of course great variety, depending chiefly on the degree of distension. In one case I observed distinctly that the percussion note of the stomach extended quite as high as the nipple. The top of the cul-de-sac, and the adjacent part of the antero-superior surface, presses upwards against the diaphragm, which separates it from the base of the left lung and the apical part of the inferior surface of the heart. If the left lobe of the liver be much developed, it extends on between the diaphragm and the part of the stomach just mentioned. Without being unduly enlarged, it extends so far that the free extremity of the left lobe and the apex of the heart lie in the same vertical

plane, and the truth of Cruveilhier's remark is very apparent, that it is the liver which immediately occupies the epigastrium, and not the stomach. The spleen lies as it were moulded to the form of the great cul-de-sac, and constitutes its immediate relation, separating it from the seventh, eighth, and ninth ribs, and from the diaphragm covering them. The gastro-splenic omentum and the vasa brevia attach the spleen to the stomach. The spleen is situated certainly rather towards the posterior surface of the stomach than the anterior. The *cardiac orifice* lies as nearly as possible opposite the seventh rib, at a point about two inches distant from its junction with the cartilage. The posterior border of the left lobe of the liver passes across it in front; behind it is the left crus of the diaphragm, the aorta, and the tenth dorsal vertebra. The *pylorus* is in contact above with the gall-bladder, near its neck, and the hepatic artery, just where it curves upwards; below it touches the pancreas. It is situated about two inches to the right of the median line, and is nearly opposite the lower margin of the angle of the cartilage of the ninth rib. Sometimes it may not extend so far to the right. Cruveilhier states that the pylorus is in relation, in front, with the abdominal wall, but it is certainly not uncommon to see it covered by the under surface of the liver.

No precise measure can be given of the *dimensions* of the stomach. These are constantly varying, according to the degree of distension of the organ, whether this be caused by the ingestion of food, or the copious development of gas in its cavity. The structure of the walls of the stomach indicates in a very marked

manner that it is intended to undergo these changes of capacity. The muscular coat of course relaxes and contracts again, the mucous readily falls into folds or rugæ, which it is easily permitted to do by the lax areolar tissue which connects it to the muscular. An atonic state of the muscular coat, such as is met with in low fevers, is very favourable to the distension of the stomach. But not only does the same stomach vary greatly in size at different periods, there are also considerable individual differences. Some persons, beyond doubt, have naturally larger stomachs than others, and in many others the size becomes actually increased in consequence of the habit of eating too much at once. In cases of obstruction at the pylorus the stomach becomes enormously increased in size, so that it may extend over the greater part of the abdomen, and reach down even to the pubes, as in a case recorded by Dr. Todd. (Med. Gaz. May 2nd, 1851.) However, putting aside for the present the consideration of morbid dilatation, the dimensions of an ordinary sized stomach of an adult, when fully inflated, may be stated to be as follows:—In its longest transverse extent 11 inches, in its vertical diameter, near the cardiac orifice, about 4 inches, in its greatest circumference, near the cardia, about 13 inches, in its circumference at the pylorus, 3 inches. The stomach on which these measurements were made held, when fully distended, 62 ounces of water.

The external surface of the stomach has already been described when speaking of its shape, we now proceed to notice its internal surface. Supposing the cavity to be laid open by an incision carried down the œsophagus through the cardiac orifice, and then along one or other

face through the pyloric, we can observe the following points. At the cardiac orifice the longitudinal plicæ of the œsophagus spread themselves out in a stellate manner, and are soon lost on the gastric mucous surface.

No specially developed ring of fibres surrounds the opening: the muscular fasciculi, both circular and longitudinal, of the œsophagus pass into those of the stomach. The œsophageal epithelium, which is of a dull whitish colour, terminates abruptly by a well-defined, but irregular border, just at the orifice; and even if this is detached, as often happens soon after death, the naked eye easily recognizes the corresponding irregular border of the gastric mucous membrane. The pyloric orifice is smaller, and much less dilatable than the cardiac; it presents a projecting ring, formed by a special development of muscular fibres, over which the mucous membrane is folded, and to which it is pretty closely attached. The whole inner surface of the stomach is traversed by longitudinal folds, which are strongly marked if the cavity is much contracted, and become obliterated according as it is distended. These longitudinal folds are often somewhat wavy, and are connected together by smaller transverse or oblique ones. They are formed solely by the mucous coat, as is very evident on cutting across a fold, when the outer surface of the two sides is seen to be closely in contact, the one with the other. Near the pyloric orifice, the longitudinal folds are much less marked, even in cases of great contraction, than in the other parts of the stomach.

The arteries which supply the stomach are so large as to make it manifest that they do not convey merely blood enough for the nutrition of the organ, they furnish, as Cruveilhier remarks, its secretion also. They

are the *A. coron. ventric.*, coursing from left to right along the lesser curvature, and anastomosing with the *pyloric* branch of the hepatic, proceeding to meet it in the opposite direction; the *A. gastro-epiploica dextra*, descending from the hepatic, passing behind the first portion of the duodenum, and then running along the greater curvature to meet and anastomose with the *A. gastro-epiploica sinistra*, which comes off from the splenic artery, or one of its divisions, and descends behind the great cul-de-sac to gain the greater curvature. Lastly, the *vasa brevia*, given off from the terminal branches of the splenic, which pass backwards and supply the great cul-de-sac.

From the main trunks, which thus skirt the greater and lesser curvatures, branches ascend and descend at right angles, upon the anterior and posterior surfaces; these again give off other branches at right angles, which run between the longitudinal muscular fibres, and when the latter are contracted fall into tortuosities; but the greater number of the arterial divisions pass on through the muscular coat, and ramify on the deep surface of the mucous, sending up large vertical twigs between the tubes, at intervals, to form the capillary plexus of the surface.

The veins follow in a reverse direction the course of the arteries, and join the vena porta at about its origin. This fact is one of much importance to remember in practice, it explains how readily congestion of the liver may be associated with a like condition of the stomach.

Lymphatic glands lie along the greater and lesser curvatures of the stomach, and around the cardiac and pyloric orifices. They are traversed by vessels

from subserous and mucous networks, on their way to the thoracic duct.

The nerves of the stomach are partly derived from the pneumogastric and partly from the solar plexus. The left pneumogastric runs over the anterior surface of the stomach, passing to the right, and distributes branches to the muscular and mucous coats. Its filaments join the plexuses accompanying the superior coronary, pyloric, and hepatic arteries, and anastomose with some of the phrenic nerves.

The right pneumogastric distributes filaments over the posterior surface of the stomach as far as the greater curvature, some joining those of the left or entering into the plexuses which surround the splenic artery, and the other branches of the cœliac axis, while the larger portion of the trunk passes on to terminate in the left semi-lunar ganglion. I have found, in accordance with the statements of Volkmann, and Bidder, that the filaments of the vagus, which are distributed to the stomach, contain a larger proportion of sympathetic than of cerebrospinal fibres. This is the case with the small filaments accompanying the arteries, and equally with the terminal branches which are seen in vertical sections of the mucous membrane: the latter seem scarcely to penetrate far into the substance of the membrane between the tubes. I have several times traced them, though very small, up to the bases of the tubes, but beyond that point they become lost very quickly.

Structure of the stomach.—The whole of the outer surface has an investment of peritoneum, except the narrow strips of the greater and lesser curvatures along which the vessels run, and a narrow strip of the great cul-de-sac corresponding to the insertion of the gastro-splenic

omentum. Cruveilhier describes the serous covering of the stomach as deficient in extensibility, and supposes that on this account the organ, as it expands, insinuates itself between the layers which form the greater and lesser omenta, which would thus be as it were drawn over it. Of the correctness of this view I doubt, partly because of the closeness of attachment of the serous membrane to the subjacent muscular, and partly because the structure of the former seems to show that it is not inextensible. It consists of beautiful wavy bands of white filamentous tissue mingled with a very fair proportion of yellow elastic curly fibre. This would surely not be present unless the membrane were extensible, following the variations which the muscular coat undergoes. Sympathetic nerve bands run in great numbers over the surface of the stomach just beneath the serous membrane, and must be more or less affected in inflammation of this texture.

The second coat of the stomach is the muscular. Its apparent thickness varies according to the degree in which the organ is contracted, and also in different individuals. In the dog, the pig, and the horse, I have found it of great thickness, and evidently capable of exerting a considerable power. Haller says, that it is generally so in the class of ruminants, in whom it has to effect a frequently recurring and natural action of vomiting. In other animals it seems to be weaker, as in the rabbit and the marten, the weasel and the squirrel, to which Haller refers. This author gives an excellent detailed account of the course of the fibres of this muscular coat, but we think it will be better simply to quote the shorter but equally accurate account given by Cruveilhier. The superficial plane of fibres de-

scends from the œsophagus as a continuation of its longitudinal fibres, and radiates out over both surfaces, and the great cul-de-sac of the stomach; a special band passes along the lesser curvature towards the pylorus, and is chiefly the cause of this curve being maintained. The next plane of fibres run transversely across the axis of the stomach, and form successive rings from the œsophagus to the pylorus. These rings intersect each other at acute angles. They are least numerous on the great cul-de-sac, and seem to accumulate gradually towards the pylorus, where they constitute a thick ring, projecting inwards towards the cavity of the stomach, and raising up the mucous membrane. It is this muscular ring alone which forms the pyloric sphincter, and not any peculiar arrangement of the mucous or submucous coats. If a vertical section is carried through the pyloric ring, the cut surface is seen to be of the same pinky tint as the muscular tissue of the walls; its base is rather wider than its apex, which is rounded, it slopes towards the duodenum, it measures from its base to its apex $\frac{4-5}{24}$ th inch, and is evidently formed solely by the great development of the circular coat, which ceases abruptly at its base on the side of the duodenum, while the external longitudinal muscular layer passes on evenly, so that the whole prominence is towards the interior.

Cruveilhier states that the pyloric ring is always more developed in old age than at other periods of life. The third plane consists of parabolic fibres applied over the convexity of the great cul-de-sac, and extending themselves over both anterior and posterior faces of the stomach. They are not very apparent, except in cases of hypertrophy of the muscular coats, generally.

The thickness of the muscular coat may be said to increase gradually from the left to the right extremity. In a medium state of distension, its thickness in the great cul-de-sac is about $\frac{1}{25}$ inch, in the mid-region about $\frac{1}{20}$ inch, in the pyloric $\frac{3}{40}$ inch, at the pylorus $\frac{3}{20}$ inch.

The muscular tissue of the stomach is of that kind which has been distinguished as organic muscular fibre, presenting none of the transverse striation of the muscles of voluntary motion, and forming much narrower flattened bands, containing numerous elongated nuclei. The mode of termination of these fibres was unknown until Kölliker described them as tapering to points, at both ends, and somewhat twisted. He regards each fibre as a separate elongated, contractile cell, and considers that they are simply arranged side by side, adhering to each other, and enveloped by areolar tissue. Although I have examined the muscular tissue of the stomach carefully, I have not been able to satisfy myself, thoroughly, of the correctness of this view; I have certainly seen many fibres tapering to a very narrow filamentous extremity, at one end, but scarce ever at both, and it seems not altogether certain that this might not be the result of dragging out the fibres with needles. When a portion of the tissue is examined, without disturbing the fibres, it appears as a stratum, having a general striation in a longitudinal direction, and marked all over with spots or patches of darker shade. Mr. Bowman attributes this appearance to the presence of numerous nuclear corpuscles, lying in the fibres, but I am rather inclined to think that it depends on numerous small swellings observable in the fibres, which Kölliker regards as the result of

local contractions. Acetic acid reduces the fibres to an almost homogeneous faintly striated layer, in which elongated nuclei, not in great numbers, are imbedded.

The *submucous tissue* is enumerated, but I think hardly correctly, by Cruveilhier as a special membrane, the fibrous. Its old name was *tunica nervosa*. It simply consists of an abundant lax areolar tissue, made up of white and elastic fibres, in which more or less fat is constantly deposited.* It is traversed by very numerous branches of blood-vessels and nerves. Its abundance and laxity permit the free play of the mucous coat upon the muscular, and allow the former to be thrown into deep folds by the contraction of the latter.

The *mucous membrane* forms the innermost coat of the stomach, and, it may be said, the most essential. If any one should desire a proof of the great advances made, in exact information, by the aid of the microscope, he may find it in comparing the account given by Haller of this tissue, scarcely 100 years ago, with our present knowledge. In his view it was a continuation of the epidermis, and like it might be thrown off and regenerated. Like the epidermis, moreover, it served to cover and protect the subjacent membrane, the “*tunica nervea*,” *ne perpetuò doleat*. In perfectly healthy specimens the gastric mucous membrane is of tolerably firm consistence, retaining its position with regard to the other coats when a thin vertical section is made, and exhibiting distinct striæ perpendicular to the surface. Its colour, when quiescent, is of a pale grey; during digestion, of a more

* In atrophic conditions of the mucous membrane an increased formation of fat cells takes place in this situation.

or less deep pink tint. The surface is perfectly smooth, and as it were polished, though, as mentioned above, thrown into considerable folds when the organ is contracted. This is the case whether the columnar investing epithelium be still *in situ*, or detached. No orifices of follicles are to be seen on naked-eye inspection, at least none that can be easily recognized. If the membrane be held up to the light, it is seen to form a continuous uniform layer free from fissures or divisions. Occasionally, when thus examined, some minute translucent spots will be observed, in which the substance of the membrane is evidently deficient. The import of these will be explained subsequently. The thickness of the membrane varies in the different regions; it is thinnest in the splenic, thicker in the mid-region, and thickest in the pyloric, as stated by Kölliker, who estimates the vertical diameter of the three regions at one-sixth to one quarter of a line, half a line, and three-quarters to a whole line, respectively. According to my observation the thickness of the pyloric region depends not so much on the depth of its tubes, as on the greater abundance of the corium in this part.

An easy method of examining the structure of the mucous membrane I have found to be the following:—Cut a small piece, say a square inch, with a pair of sharp, strong scissors, from the part which it is intended to examine. Let this be placed between the left forefinger and thumb, in such a way that a clean-cut edge may be presented; with a sharp pair of scissors it will now be easy to take off a vertical slice from the cut surface, and, after a little practice, very thin sections may in this way be obtained. The portion

separated is removed by a needle from the blade of the scissors on to a slip of glass, a drop of water added, and the specimen covered with a thin lamina of glass, after it has been so arranged, that the free surface of the mucous membrane, now a thin edge, looks downwards. If a healthy specimen, thus prepared, be held up to the light, the bundles of tubes will be seen distinctly marked out by vertical striæ, the corium of the mucous membrane can be distinguished, and the lax areolar submucous tissue beneath. Viewed by a power of 40-60 diameters, a thin section taken, as just described, from the gastric mucous membrane of an animal recently killed, presents the following appearances, proceeding from above downwards :—First, there is a layer, which is more translucent than that below, extending through about one-fifth of the vertical diameter of the mucous membrane. This is so arranged as to form folds and laminæ, which include spaces, and presents a rather irregular, wavy upper margin. The laminæ are marked by minute striæ, vertical to the surface on which they are set. This layer passes rather gradually into that below. It is the columnar epithelium, which after a short time falls off, and leaves bare the basement membrane on which it rested. The individual particles are elongated, and contain an oval nucleus in their interior; their free extremity is flat, their attached often pointed. They adhere to each other by their sides, and often form large flakes, by thus remaining after they have been detached from the basement membrane. These particles are continued downwards a little way, as a tubular lining to the commencement of the follicles, and seem to change rather gradually

into the cell-growth which occupies the tubes. These tubes extend downwards, in a tolerably straight direction, to a layer of condensed fibrous tissue, which may be termed the corium, upon which their blind ends rest. In animals it seems as if each follicle, at a little depth from the surface, divided into two, three, four, or perhaps more secondary tubes, which present lateral bulgings, more or less marked. In man it often appears as if there was but a single tube to each follicle, but it is very possible that two of them may unite very near the surface. I have occasionally seen short offsets proceeding from the tubes in the splenic and mid-regions, near the terminal extremity, and in the pyloric this is still more frequent, and the branch comes off higher up. The diameter of the orifices of the follicles on the surface is about $\frac{1}{500}$ inch— $\frac{1}{250}$ inch, exclusive of their lining epithelium, which of course narrows the space considerably, perhaps to one-third. The diameter of the tubes is greater generally at their terminal extremity, which is somewhat flask-shaped: I have found it as much as $\frac{1}{250}$ inch; a more usual magnitude is $\frac{1}{333}$ inch. Kölliker states it to vary from $\frac{1}{600}$ inch to $\frac{1}{333}$ inch. From the corium there passes off a very delicate atmosphere of fibrous tissue, which ascends upwards among the tubes, but is more distinct about their bases. This inter-tubular fibrous tissue seems to be most abundant in the pyloric region. If the blood-vessels are congested or filled with artificial injection, their branches may be well seen, in such a section as we are describing, passing vertically upwards to open into a plexus of unusually capacious capillaries, encircling the orifices of the follicles just beneath the basement membrane of the surface.

The tubes are surrounded in their whole length by delicate straight vertical capillaries, connected by cross branches, so as to form a plexus, with elongated meshes. The diameter of these capillaries is $\frac{1-3}{5000}$ inch ; that of the large ones, surrounding the orifices of the surface, is double or treble this size. Below the corium we come, lastly, to a small quantity of adhering submucous areolar tissue, which invariably contains fat-cells, sometimes in large quantity. It is traversed by branches of vessels and sympathetic nerve-bands, which are well brought out by the addition of a little acetic acid. The nerves may be traced as far as the bases of the tubes, but they cannot be followed upwards among the tubes, and there is no evidence to show that they reach the surface. In structure the tubes are easily seen to consist of an homogeneous membrane, enclosing an abundant cell-growth. This membrane is continuous with that which invests the free surface of the mucous tissue, and may be regarded as an involution of it. Both are simple expanses of the same structureless membrane, which is found so commonly intervening between the blood and the actual working substance of an organ. The use of this layer seems to be in part, certainly, mechanical, giving support and a definite form and arrangement to the elements it encloses ; in part also it may have a peculiar filtrating action, modifying the plasma exuded from the capillaries as it passes through its texture in the business of nutrition. The cell-growth contained in the tubes consists of large, well-formed cells (*vide* fig. 9), varying from $\frac{1}{1000}$ to $\frac{1}{2000}$ inch in diameter, with celloid particles, free nuclei, and granular and oily matter. The

large cells contain a distinct nucleus, lying in a quantity of soft, granulous substance, very often imbedding oil molecules in varying numbers. The granulous contents are no doubt proteine substance, as they are rendered translucent by acetic acid and liq. potassæ. The nuclei are often very large, and form rather conspicuous objects, especially those which are free. I do not think the formation of perfect cells is at all essential to the healthy and efficient condition of the gastric glandular epithelium; there is no reason to doubt that in this instance, as well as in that of the liver, free nuclei and granular matter are quite equivalent to perfect cells with envelopes. It appears to me, as it does to Kölliker, that the tubes are generally *filled* with their epithelium. I can discern no central canal, certainly nothing like that which exists in the renal tubes. The lower part of the tubes, perhaps the lower third or fourth, is very commonly of an opaque, whity aspect, both in man and the common domestic animals. I am inclined to think that this depends on the presence of much oily matter, in a very finely divided state, in the epithelium, but this is not proved. The opacity disappears in great measure when the contents of the tubes are pressed out into the surrounding water.

In vertical sections of the gastric mucous membrane in the human subject, where the columnar epithelium is constantly found detached and the basement membrane of the surface exposed, there are not uncommonly seen papillar eminences of varying length, standing up from the surface vertically (*vide* fig. 10). These have a defined margin, almost as if invested by homogeneous membrane, and might

easily be mistaken for the true villi to be presently mentioned. By exerting, however, a little pressure on the covering slip, while the effect is watched, it is very apparent that these papillar prominences are really masses of altered epithelium protruding from the follicles. They are forced further on, and so become more elongated. Even when there is no epithelium protruding in this way, it may be sometimes observed that the tubes are filled with their contents quite up to the level of the surface, so that a vertical section shows as it were a number of parallel cylinders of granulous substance with evenly rounded upper ends. Now on pressing such a section as this, the epithelial cylinders will rise out of the follicles, and assume the appearance of papillæ or villi. The epithelium contained in the tubes may consist, more or less, entirely of cells: the outlines of these in some specimens are very evident as they lie together, in others they are concealed by the abundant free granular matter in which they lie imbedded. Whatever may be the condition of the epithelium in the deeper parts of the tubes, that which protrudes from the follicles or is just ready to protrude, always consists of a uniform coherent granulous mass, the cells having become fused down into this state. The nuclei, however, seem to persist and to be thrown off little altered. Haller and Cruveilhier agree in describing the surface of the gastric mucous membrane to be covered over with villi, which the latter compares, for their number, to the pile of velvet. This description is certainly not correct, the mucous surface in the splenic and mid-regions shows but seldom any trace of villi; in the pyloric, however, they are usually well marked, and

present a conical, or more laminar shape (*vide* fig. 20). The basement membrane which lines the rest of the surface passes over and invests them, while their interior is occupied by capillary loops imbedded in a nucleated granulous substance. This substance, in this situation, is normal, as well as immediately beneath the basement membrane of the general surface, to a small amount, but it often undergoes abnormal development in conjunction with wasting of the tubes. We have already mentioned that a very sparing quantity of areolar tissue penetrates among the tubes, so small a quantity, in fact, that the interspaces of the tubes in the more healthy specimens appear empty. The knowledge of this is an important *point de départ* in judging of diseased conditions. The glandular structure at the cardiac orifice commences much as one would expect from the naked-eye appearance. There first appear some isolated groups of shortish follicles, having the same structure as the stomach tubes; these increase in length and are set close together, so that at the distance of a few lines a vertical section presents the usual appearance. At the pyloric orifice I find nothing very remarkable in the mucous membrane. My observation leads me to agree with Kölliker, that the tubes in the pyloric region do not divide and ramify into terminal vesicles, so as to deserve the epithet "grape-like," which Bischoff and Bruch have applied to them. In their most natural state I believe them to be either simple follicles, or slightly ramified at their lower parts. I agree also with the authors of the "Physiol. Anat.," and with Kölliker, that the epithelium lining the pyloric tubes is different from that which lines those of the other

regions. It resembles more the columnar epithelium of the surface, is more made up of perfect cell-particles, and is more disposed as a lining to the tube, leaving in its interior a central canal.

With regard to the corium of the mucous membrane, mention must be made of the discovery of Middeldorpf, confirmed by Bruch and Kölliker, that it contains a layer of delicate organic muscular fibres, quite distinct from that of the proper muscular coat. Kölliker is inclined to think that these contractile fibres are continued actually into the mucous membrane and even into the villi. I have not been able to discover these muscular fibres in the corium; all that I have seen is, that there are often numerous elongated nuclei in this layer, especially in the pyloric region, which can belong to neither of the component elements of areolar tissue, and may therefore indicate the presence of the fibres in question, though they may also exist in consequence of the formation of new fibrous tissue. There is, however, a circumstance, which will hereafter be referred to, which furnishes independent proof that their view is correct.

The description now given of the gastric mucous membrane may be said to comprise all that is absolutely essential to the effective fulfilment of its function, but there are found in it certain other structures which scarcely appear to contribute anything to its completeness or activity, but rather to exist as so many imperfections and, it may be, foci of diseased action. These are the solitary or lenticular glands, perfectly similar to those which exist in the intestines, but scarcely so well known to anatomists. They are demonstrated most easily by immersing the mucous membrane,

after it is dissected off, in dilute acetic or muriatic acid, when they appear as dead white, opaque, round, or linear bodies, about the size of a pin's head, some larger and others smaller, lying in the deeper part of the mucous membrane, and extending more or less up towards the free surface (*vide* fig. 28). These bodies are seen with great facility in the splenic region of the pig's stomach, and in that of the cat's, as well as in the middle and pyloric regions of the latter. In the stomachs of the rabbit and the dog I have not found them. Their structure is exceedingly simple, consisting merely of solid masses of nuclear particles surrounded by no homogeneous membrane, but only by some condensed fibroid tissue. A very sparing quantity of granulous matter is mingled with the nuclear corpuscles. If a vertical section be made through the mucous membrane at the spot where these corpuscles are imbedded, they are seen to encroach upon the tubes which appear shortened or wasted above them (*vide* fig. 28, a). The question whether these bodies are normal structures in man or not, can scarcely be said to be yet decided. Cruveilhier says, "the follicles are very difficult to demonstrate in man, so that with many anatomists I have long doubted their existence in some individuals they are, however, extremely distinct." Haller seems to have only seen them once or twice; he describes them as "simplices, rotundas, lenticulares, membranaceas, cavas, brevi ductu per villosam productas," and concludes that their existence is not to be rejected, although they cannot always be demonstrated. The two last characters which Haller mentions, are wrongly ascribed to these structures. Kölliker

says, "the lenticular glands certainly do not occur constantly in the stomach of the adult, even if, perhaps, they are always present in children; at least in very many cases one finds no trace of them. In others, they are seen to be extremely numerous, covering over the whole upper surface of the stomach, yet one cannot forbid the thought that the diseased conditions of the mucous membrane which are always present have much to do with their formation." In the numerous examinations which I have made, I have very frequently found them, although they might have been easily overlooked in the method of examination by vertical sections. Out of four cases where I made especial search for them, the stomachs being healthy, they were large and manifest in three, whose ages were 5, 11, and 9 years. In the other whose age was 4 years, no trace could be found of them after maceration in dilute acid. It would require a large number of observations directed particularly to the point in question to determine positively whether in man they are to be regarded as normal or abnormal productions; the conclusion, however, seems to be highly probable that they exist normally in most individuals, though in some they may be quite absent. Neither is it quite clear what amount of enlargement of these bodies is to be considered morbid, only it may be remarked that, as they are essentially extra-tubular formations, their increase must take place at the expense of the true secreting structure, and must, therefore, be prejudicial to the efficiency of the organ, if it proceed to any great extent. In the chapter on the morbid changes occurring in the stomach, further notice will be taken of the hypertrophy and atrophy of the solitary

glands. In two papers published in the Association Journal, I have designated these bodies as nuclear masses, a term which though unsanctioned by authority is, in some respects, preferable to that of solitary glands, as it simply describes their constitution, and, while indicating their difference from ordinary glands, leaves open the question of their being normal or abnormal formations. It may be suggested that there seems to be a good deal of resemblance between the solitary glands of the stomach and the Malpighian bodies in the spleen. The splenic structures have very nearly the same constitution as the gastric: like them they are constant in some animals, like them they are often very indistinct or wholly absent in the adult, and like them they undergo in some cases a morbid hypertrophy.

CHAPTER II.

PHYSIOLOGY OF THE STOMACH.

THE gastric juice, by the accordant testimony of Lehmann and others, is, when pure, completely clear and transparent, almost quite colourless, or at least faintly tinged yellow. It is a thin fluid, of very weak, peculiar smell, and scarcely noticeable saltish acid taste. Its specific gravity scarcely exceeds that of water. It is highly acid, does not become turbid by boiling, but its transparency is sometimes slightly disturbed by alkalies, added in sufficient quantity to neutralize it. An almost special peculiarity which it possesses is, that it is very slow to putrefy, and arrests this process in substances in which it has already commenced, when they are placed in it. This, however, is only true of it when pure, at least according to Dr. Beaumont, for he states, that if it be diluted with saliva, it becomes foetid in a few days. Microscopically examined, there is nothing very characteristic to be observed in it. In some cases, probably there is nothing to be seen except a little fine granulous matter; in others, nuclei of the epithelial particles from the stomach-tubes, or even complete cells, may be detected.

Chemists are not agreed as to the exact constitution of the gastric juice. All, with the exception of Blond-

lot, find in it free acid, but there are different opinions as to the nature of this. Besides the acid, there is also a peculiar azotized organic principle, and certain salts. Dr. Prout stated long ago, that free muriatic acid existed in no small quantity in the gastric juice poured out during digestion. His statement has been confirmed by Berzelius, Lehmann, Bidder, and Schmidt, and Bence Jones. It has been questioned by Bernard and Barreswill, and Dr. R. D. Thomson, who consider that the free acid is the lactic. Lehmann seems to have established that this acid is certainly often present in considerable quantity, although Schmidt, in his latest analyses of the gastric juice of dogs, was satisfied of its absence. That both these excellent observers are right cannot be doubted, as Lehmann candidly and philosophically admits of his opponent; and there can be, therefore, but one conclusion, (such as in like cases is not rare,) viz., that the gastric juice may contain either or both, and probably in varying proportions. Both operated on dogs; fourteen doomed for offences against sanitary police furnished Lehmann with gastric juice after their deaths, while Schmidt drew a constant supply from an animal especially distinguished by having his salivary ducts ligatured, while his stomach was provided (*versehen*) with a fistulous external opening. Lehmann fed his dogs with horse-flesh and fatty bits of bone, the latter being given only a quarter of an hour before their execution. He found in the contents of their stomachs not only free muriatic acid, but a considerable quantity of lactic also. Acetic acid has been found by Lehmann in vomited food, when no vinegar had been taken with the meal. Butyric acid has been found by Frerichs in

the stomachs of fasting graminivorous animals. These, it is probable, are only accidentally present. The quantity of free muriatic acid in the gastric juice is estimated by Lehmann at 0·098—0·132 per cent., that of free lactic at 0·320—0·585. The saline constituents of the gastric juice are chiefly chloride of sodium, with smaller quantities of chlorides of lime, magnesium, and iron, and of phosphate of lime. The organic constituent of the gastric juice is a substance of albuminoid character, not coagulated by heat, but precipitated by alcohol, tannic acid, bichloride of mercury, and salts of lead, more or less completely. It exists in the gastric mucous membrane, from which it can be extracted by infusion in distilled water, acidulated with muriatic or other acids. This great discovery was made by Eberle, but he erred in believing that the same property belonged to all mucous membranes. Later careful observation has shown, not only that other mucous membranes will not yield a digestive principle, but that even the gastric mucous membrane itself does not yield it, or only in a slight degree, in those parts which have not the special organization we have already described. The pig's stomach is the best instance we are acquainted with of marked difference in structure in different parts of its extent; and the observations of Todd, and Bowman, and Goll, are to the same effect, that the middle region, which is made up of tubes filled with true glandular epithelium, exerts a much stronger digestive power than any other part. Goll, as quoted by Kölliker, states, that the gland tubes containing round cells, (spheroidal epithelium,) in a very short time effect the solution of acidulated proteine coagula; while those containing

cylinder epithelium are either powerless to produce any such effect, or only produce a slight action after a long period. This result, the reflection that there really is no other constituent of the mucous membrane which could yield an albuminous matter, the proceeding adopted by Lehmann to prepare an artificial digestive fluid, and the fact, that papilloid masses of altered epithelium may be seen protruding from the orifices of the follicles, amount to a proof, in my judgment, that the granulous matter of the epithelium is the source of the Pepsine, the name given by Schwann to the digestive principle. The mode of obtaining this substance is somewhat as follows:—A watery infusion is made of the middle part of the mucous membrane of a pig's stomach: when filtered, this is neutral, transparent, and rather slimy; it is precipitated by acetate of lead, redissolved, again precipitated by sulphuretted hydrogen, to remove the lead, and finally, by the addition of alcohol to the remaining fluid, the pepsine is precipitated in the form of white flocculi. Lehmann details the properties of the pepsine thus obtained as follows:—"When dry, it forms a yellowish, gummy, slightly hygroscopic mass, which, in the moist condition, is white and bulky, and easily soluble in water. It always retains some free acid, so that it reddens litmus. Alcohol precipitates it from its solution in water, and so do all the metallic salts more or less completely, except ferrocyanide of potassium. Acids (mineral) cause at first some turbidity in the neutral solution of pepsine, which disappears on the addition of more acid, but is reproduced by acid in excess, so that the pepsine falls down as a flocculent precipitate." This substance acts most

energetically in promoting the solution of proteine compounds. Wasmann states, that pieces of coagulated albumen are dissolved, in six to eight hours, in a weakly acidulated solution, containing only $\frac{1}{60000}$ part. In what way the pepsine acts, in thus promoting the solution of substances brought into contact with it, is purely matter of conjecture. The most probable opinion is, that the change it induces belongs to the class of catalytic actions, which it certainly resembles much more than the process of fermentation. The change, however, seems to be almost confined to the form in which the altered substances appear. Proteine compounds, if liquid, are coagulated, and when coagulated, are again liquefied, but there is no evidence that they undergo any chemical change. Starchy and oily matters remain quite unchanged by the action of gastric juice. Lehmann gives the following summary of facts relative to the circumstances which affect the digestive power of the gastric juice:—"It is destroyed by boiling, by saturation of the free acids with alkalies, or even with phosphate of lime, by sulphurous and arsenious acids, by tannic acid, alum, and most of the metallic salts. Schmidt finds that the addition of bile to the gastric juice completely destroys its solvent powers, even though it still remains decidedly acid. It is very much impeded by alkaline salts, or saturation of the fluid with *peptons*,* or other organic, azotized, or non-azotized substances. The addition of

* The name given by Lehmann to the products of digestion of proteine and gelatine compounds. He states that they differ from the original substances by their ready solubility in water and dilute alcohol, their want of coagulating and gelatinizing powers, and non-formation of insoluble compounds with most metallic salts. Their chemical composition is not altered.

water to a gastric juice, which has already saturated itself with pepton, has the effect of enabling it to digest a still greater quantity of proteine substance. The same effect is also produced, to a certain extent, by the renewed addition of free acid. Too much free acid, without the proper dilution with water, completely abolishes the digestive power. The most favourable proportion (for efficiency) which the free acids should have to the gastric juice, is, that 100 parts of the fluid should require about 1.25 parts of potash for its saturation. Hydrochloric and lactic acids are the only ones which produce, with pepsine, energetic digesting fluids. Sulphuric acid, nitric acid, and acetic, produce, in conjunction with pepsine, only a weak digestive mixture. Phosphoric acid, oxalic, vinic, succinic, &c., are by no means able to replace the lactic or hydrochloric in the business of digestion. Fatty matters, added in certain quantity to the gastric juice, accelerate the conversion of the proteine substances into peptons."

It is of course almost impossible to form a correct estimate of the quantity of gastric juice which is secreted in a given time, say twenty-four hours. The result of Bidder and Schmidt's experiments upon dogs, whose stomachs were perforated by fistulous openings, is that the dog secretes at least 10 per cent. of his whole weight in gastric juice during a period of twenty-four hours. This certainly appears a large quantity, yet, according to other experiments, it would only be sufficient to digest about one-half of the quantity of albuminous matter necessary for the sustenance in health of an animal fed exclusively on flesh. If the stomach were the only part where digestion of proteine compounds took place, this result would appear

scarcely credible; but it is remarkably supported and confirmed by other experiments performed by the same observers, in which it was positively proved that pieces of flesh and coagulated albumen were digested more or less completely by the action of the intestinal secretion, whether quite pure or mingled with bile and pancreatic juice. The result is so important that it seems worth while to give Lehmann's details of the proceeding.* "The duodenum of cats, who had not been fed for some time, was cut into, below the orifices of the pancreatic and biliary ducts, and tied closely over a cork plug, which was pushed into the upper end, so that the gastric, pancreatic, and hepatic secretions were absolutely excluded. Two cylindrical pieces of flesh and albumen, sewed up in muslin bags, were pushed into the lower end as far as possible, and their return prevented by ligaturing the cut opening. The intestine was then replaced, the wound in the belly sewed up, and the animal allowed to live for five or six hours.

"On examination, after death, the bags were found low down in the small intestine; they appeared even externally much collapsed; when opened, the pieces of flesh and albumen appeared macerated, as if in the gastric juice, pretty strongly alkaline—the albumen especially, quite softened down and pulpified, and the weight so reduced that, in twelve experiments, it amounted only to a quantity varying from $\frac{1}{2}$ to $\frac{1}{11}$ of the original. In the latter case, the contents of the bags had almost quite disappeared. The result was the same when only the gastric juice was excluded, and the access of bile and pancreatic fluid

* Phys. Chem. ii. 113.

freely permitted. Even out of the body the intestinal secretion has the power of dissolving proteine substances, both when it is pure and alkaline, and also when it is mingled with bile and pancreatic juice."

The above experiments of Bidder and Schmidt appeared to me so important, that I thought it desirable to repeat them. I have done so in two instances, and in both obtained corroborative results. The details of the second observation seem to me worth recording. A half-grown kitten was put under the influence of chloroform, the abdomen opened, and an incision made into the duodenum. A piece of lightly-roasted mutton, included in a muslin bag, weighing together $20\frac{3}{4}$ grains, was put into the lower part of the duodenum with some difficulty, from the tonic contraction of the intestine. It was retained in its place by a ligature tied round the gut, between the incision and the place where it lay. Another ligature was applied to the upper part of the duodenum, just below the opening of the duct from the liver. Another piece of meat, in an exactly similar bag, and of exactly the same weight, was placed in the peritoneal cavity. The intestine was then replaced in the abdomen, and the wound brought together by stitches. She lived several hours, and was found dead the next morning. On examination, the bag which had been put into the intestine was found in the same spot, its surface was covered with alkaline mucus, it was thoroughly moistened, much more so than when it was put in. It weighed, after being cleansed from the mucus adhering to it, $14\frac{3}{4}$ grains, and had, therefore, lost 6 grains. After drying six hours in the air, without being exposed to a fire, it weighed just over

10 grains; it was still moist, apparently in about the same degree that it was when first put into the duodenum. The total loss in weight was, therefore, about $10\frac{1}{2}$ grains, or fully one-half. The bag placed in the peritoneal cavity was moistened a good deal, but did not appear otherwise altered; it weighed immediately after removal $23\frac{1}{2}$ grains, and had, therefore, gained $2\frac{3}{4}$ grains in weight: after drying in the air the same time as the other bag it still weighed $17\frac{3}{4}$ grains, and its loss, therefore, only amounted to 3 grains, while that of the other was more than three times as much. On opening the bags it was found that the piece of meat which had been in the peritoneal cavity was somewhat macerated and softened, but it retained its fibrous texture very well. The portion which had been in the duodenum showed much less of fibre under the microscope; the remaining fibres were much softer than those which had been in the serous cavity; the former were broken down by moderate pressure into amorphous substance, the latter were very little altered. The same change was observed in the other experiment; the piece of meat which had been exposed to the action of the intestinal fluids had lost its cohesion throughout, and broke up very readily. There was very little inflammation of the mucous coat, and none of the peritoneal, in the experiment above detailed. From the result obtained, it seems quite impossible to entertain any doubt that the intestinal fluids do exert a solvent action on muscular tissue, which is not possessed by the fluid exhaled from a serous surface. It is clear that the change effected was not the result of mere maceration. The somewhat startling results of Bidder and Schmidt's observations

will not be thought by any sound-judging physiologist to detract from the importance of the function of stomach digestion ; they present, however, another interesting instance of the compensating action which prevails among various correlated organs of the body. Further, they afford a hint that it is not so much the acid, as the organic constituent, of the gastric juice which plays the principal part in effecting the solution of proteine aliments in the stomach.

The gastric juice is poured out under the influence of a stimulus applied to the mucous surface. The normal stimulus is of course the contact of food, but the introduction of any non-digestible substance, such as the bulb of a thermometer, will have the same effect. The following is the account given by Dr. Beaumont of the phenomena observed during the active state of the mucous membrane in digestion. “On the application of aliment, the action of the vessels is increased, the colour brightened, and the vermicular motions excited.” If the thin covering of mucus “be wiped off with a sponge or handkerchief during the period of chymification, the membrane appears roughish, of a deep pink colour.” “The invariable effect of applying aliment to the internal but exposed part of the gastric membrane, when in a healthy condition, has been the exudation of the solvent fluid, from the above-mentioned papillæ. Though the apertures of these vessels could not be seen, even with the assistance of the best microscopes that could be obtained, yet the points from which the fluid issued were clearly indicated by the gradual appearance of innumerable very fine lucid specks, rising through the transparent mucous coat, and seeming to burst and discharge themselves upon the

very points of the papillæ, diffusing a limpid thin fluid over the whole interior gastric surface. This appearance is conspicuous only during alimentation or chymification. These lucid points, I have no doubt, are the termination of the excretory ducts of the gastric vessels or glands, though the closest and most accurate observation may never be able to discover their distinct apertures." What these lucid points are will be pretty clear from the description already given, p. 19, of the epithelial contents of the tubes, and the way in which they are often seen protruding on the surface. No apertures of course exist in them; they furnish the secretion by liquefying as they rise up. "The fluid so discharged is absorbed by the aliment in contact, or collects in small drops and trickles down the sides of the stomach to the more depending parts, and there mingles with the food or whatever else may be contained in the gastric cavity." Dr. Beaumont draws a most important distinction between the *gastric fluid* secreted as above described, and the *gastric mucus*. The one is a special secretion, acid, limpid, colourless. The other has the common characters of mucus in other parts. It is highly interesting and instructive to observe that it was by no means possible to obtain an unlimited quantity of the gastric fluid by applying a stimulus to the coats of the stomach. More than one and a half or two ounces could never be collected, however long the period of abstinence had been. "Whenever fluid was obtained in larger quantity, as was sometimes the case, it invariably contained more than the usual quantity of mucus." The irritation of disease, as we shall see, has the same effect, producing a large quantity of mucous fluid, but not the digestive solvent. The legitimate

inference from this fact cannot be too strongly insisted on; the weak stomach cannot supply the ordinary amount of gastric juice, and therefore, if the ordinary amount of food be taken which the healthy system can receive and digest, it is so far from affording nourishment and strength, that it becomes a burden, an irritation, and cause of debility.

The movements of the stomach have been carefully observed by Dr. Beaumont, and I am not aware that there are any other records which have nearly the same value as his. Observations on animals recently killed while digestion is taking place, or on living animals by laying open the abdominal cavity, cannot be regarded so trustworthy as those afforded by the rare opportunity he so well used. The course which a morsel of food takes after it has entered the stomach as it has been traced by Dr. Beaumont is peculiar, and would hardly have been anticipated. He states that "after passing the œsophageal ring, it travels from right to left along the small arch; thence, through the larger curvature, from left to right. The bolus, as it enters the cardia, turns to the left, passes the aperture, descends into the splenic extremity, and follows the great curvature towards the pyloric end. It then returns in the course of the smaller curvature, makes its appearance again at the aperture in its descent into the great curvature to perform similar revolutions." "These revolutions are completed in from one to three minutes." "They are slower at first than after chymification has considerably advanced." Together with this movement by which the food is carried round the stomach, there is also an agitating movement which causes the whole of the

gastric contents to become intimately mixed and blended together. Dr. Beaumont believes that "portions of chyme are constantly passing into the duodenum through the pyloric orifice, as the mass is presented at each successive revolution." He infers "this from the fact that the volume is constantly decreasing." When the process of chymification is approaching its completion the transit of the gastric contents into the duodenum becomes "rapidly accelerated." This is effected, according to Dr. Beaumont, by a peculiar action of the transverse muscular fibres situated three or four inches from the pylorus. If a long glass tube were passed through the aperture in St. Martin's side towards the pyloric region of the stomach, during the latter stages of digestion, a forcible contraction was first perceived at this point, and the bulb was stopped." After "a short time, there was a gentle relaxation, when the bulb passed without difficulty, and appeared to be drawn, quite forcibly, for three or four inches towards the pyloric end. It was then released, and forced back, or suffered to rise again;* at the same time giving to the tube a circular, or rather spiral motion, and frequently revolving it completely over." Above the contracting band, and towards the splenic portion of the stomach, the suction or grasping motion is not perceptible; but when the bulb is pushed down to this point, it is distinctly felt to be grasped and confined in its movements." "The peculiar contractions and relaxations, mentioned above, succeed each other, at irregular

* The expression of *rising* has reference to the position in which the man lay, on his right side, so that the aperture into the stomach was uppermost.

intervals, of from two to four or five minutes. Simultaneously with the contractions there is a general shortening of the fibres of the stomach. This organ contracts upon itself in every direction; and its contents are compressed with much force. The valvular portion of the stomach is firmly thrust into the aperture, closing the orifice, preventing the egress of aliments, and obstructing the view of the interior. During the intervals of relaxation, the rugæ perform their vermicular actions, the undulatory motions of the fluids continue, and the alimentary and chymous masses appear, revolving as before, promiscuously mixed, through the splenic and cardiac portions. All these facts, taken together, will, I think, rationally admit of the following explanation: the longitudinal muscles of the whole stomach, with the assistance of the transverse ones of the splenic and central portions, carry the contents into the pyloric extremity. The circular or transverse muscles contract progressively, from left to right. When the impulse arrives at the *transverse band*, this is excited to a more forcible contraction, and, closing upon the alimentary matter and fluids contained in the pyloric end, prevents regurgitation. The muscles of the pyloric end, now contracting upon the contents detained there, separate and expel some portion of the chyme. It appears that the crude food excites the contractile power of the pylorus, so as to prevent its passage into the duodenum, while the thinner chymified portion is pressed through the valve, into the intestine. After the contractile impulse is carried to the pyloric extremity, the circular band, and all the transverse muscles, become relaxed, and a contraction commences in a

reversed direction, from right to left, and carries the contents again to the splenic extremity, to undergo similar revolutions." Dr. Beaumont then cautiously expresses his opinion "that the discharge of the chyme from the stomach is effected by the mechanical impulse," rather than by the *ignotum quid* of a selecting power in the pylorus. In this none at the present day can doubt he is essentially right; no more selecting power can be ascribed to the pylorus than that it contracts in response to the stimulus of masses of undigested food pressing against the mucous membrane which covers the adjacent region. As the solid aliment becomes more dissolved, the constrictor muscle at the outlet will be less excited to contract, and a greater quantity of fluid chyme will be pressed out into the duodenum. With regard to the view of Dr. Beaumont that there exists a special transverse band of muscular fibres, which contract so as to include the gastric contents in the pyloric region of the stomach, while they are forcibly compressed further and thrust towards the pylorus by the muscular coat surrounding this region, I cannot but think its improbability is so great, that it needs further confirmation before it can be received. The phenomena observed by Dr. Beaumont would be sufficiently explained by the difference which Dr. Todd and Mr. Bowman have noted in the action of the cardiac and pyloric portions. In the cardiac two-thirds the movements consist in a slow, steady, sustained contraction; in the pyloric they resemble the peristaltic action of the intestines. This must, however, be supposed to have reference to the periods of intermitting contraction when the stomach seems

to exert an expulsive force; in the intervals of these the revolving movements above described take place. How these are produced it is not very easy to conceive; but the observations of Dr. Beaumont on this point are so clear and precise that it can scarcely be supposed that he was mistaken as to the fact. The hour-glass contraction occasionally observed in the human stomach after death, as well as in that of animals, might be thought to give some support to the opinion that a regular constriction of the cavity of the stomach is effected by the transverse band at the period of expulsion; but it does not appear at all proved that this contraction, when it does take place, completely separates the left from the right side of the organ; certainly, in the cases I have seen, it has not appeared to be so. Professor Müller says, "The central constriction of which the stomach was by Sir E. Home imagined to be the seat during digestion has never actually been observed. Neither Tiedemann nor I have seen anything of the kind in dogs."* The

* Dr. Brinton has examined very ably the movements of the stomach, and recorded his observations on these and other points in the physiology of the alimentary canal, in the Medical Gazette, 1849. He states that in the early period of digestion, a transverse constriction "sets out from the cardiac extremity, and travels slowly towards the pylorus." At first it is rather feeble, but when it reaches the locality of the transverse band, it suddenly becomes much more distinct, and passes rapidly forwards as a well-marked circular depression, until it reaches the pylorus. A period of relaxation which lasts about a minute now ensues, and the contraction occupies about the same time. At a later period of digestion "the cardiac extremity dilated by its contents is more quiescent than in the earlier stage." Such movements as it presents are very slight. "The chief visible commencement of contraction is by a constriction," which shows itself in the same position as the sudden increase in the former case, but is much deeper than it. After continuing a short time, it passes onwards to the pylorus, nearly obliterating the canal in its course, and terminates by engaging the pylorus. Dilatation follows, "the central hour-glass contraction being the last which disappears, as it is also the first to return." The period of con-

contractile power of the coats of the stomach is certainly weakest in the great cul-de-sac, the muscular coat being thinnest here, and it is in this situation that softening of the mucous membrane always first and chiefly occurs. It is also in the region of the left side, corresponding nearly with this part, that persons with weak and irritable stomachs commonly complain of pain, though of course it is not confined to this situation. These concurrent circumstances suggest the idea that defective contractility of the muscular wall of the great cul-de-sac may be the original cause of the change produced in the mucous membrane, and of the pain experienced during life. Unhealthy residua of digestion would settle there, and would affect the membrane injuriously all the more from its being spread out, and not drawn together and thickened. It is very clear, that, as the digestive process draws towards a close, the contraction of the pylorus must remit considerably, as it allows of the passage of stones of fruit, and even much larger bodies, as clasp-knives. I think the cause of this relaxation may be found in the declining vascular injection and excitement of the mucous membrane, in consequence of

traction is rather shorter than in the early stage, but that of relaxation rather longer, from one to three minutes. Dr. Brinton then proceeds to describe a very neat experiment, by which he demonstrates that a circular contraction moving onward along a tube which is nearly filled with fluid and closed at both ends, will produce a current in the opposite direction along its axis, a reversed axial current as he terms it. He thinks that by the existence of a current of this kind the revolving movement of the food described by Dr. Beaumont may be accounted for. In this opinion I cannot join, chiefly for the reason that the revolving movements are continuous, while the peristaltic are periodic. It is also obvious that it is the thinner, more fluid, and dissolved portion of the gastric contents, that would chiefly pass backward in the axial current. This however is that which is most fitted to pass into the duodenum.

which the impressions made upon it are less vivid, and produce less reaction.

It seems to be well established that the movements of the stomach are not by any means solely dependent on nervous influence conveyed through the vagi. Magendie has seen these movements continue after section of the vagi; and Dr. Reid has ascertained that if an animal recovers from the first effects of the operation, "the stomach can still propel the chyme onwards into the duodenum." The same observer states, that after repeated trials he is confident that galvanic stimulation of the lower ends of the divided vagi often produces muscular movements in the stomach of a living animal, though not invariably. These movements differ much from those of the œsophagus, "they are more slow and vermicular." In one experiment which I performed myself there was constant vomiting during life, and after death the stomach was found extremely contracted and empty: the nerves were thoroughly divided. Müller's observation is to the effect that irritation of the celiac ganglion in the rabbit produces not the slightest influence upon the stomach. If the stimulus, however, was applied to the stomach itself, it produced immediate contraction. This seems to be the case with almost all the internal viscera, that the action of their muscular walls is far more effectually excited by an impression made on the membrane covering them, whether this be a mucous or serous, than by irritation of their nerves.

The insensibility of the mucous membrane of the stomach under conditions of health is somewhat remarkable, considering the numerous branches of nerves which are distributed to this organ. Most of

these, however, go to supply the muscular coat, and those which pass on to the mucous (as already stated) cannot be traced further than a little above the bases of the tubes. It is, therefore, not surprising that healthy stimuli on the surface, while they excite the muscular coat to contraction, should not produce conscious sensations. A further reason, no doubt, is the exclusively sympathetic character of the nerves which are distributed to the mucous membrane; these consist, so far as I have seen, solely of the special sympathetic nucleated nerve-bands, unmixed with cerebro-spinal tubules. In a diseased state, however, the mucous surface is far more sensitive; patients not only complain of a dull sense of weight, and of tenderness, on pressure, in the epigastrium, but of acute pain or sensation of rawness if anything hot or irritating is swallowed. The explanation of this seems to be, that by the erethysm excited in the vicinity of inflammatory action, the sensibility of the nerves in the submucous tissue is heightened, so that they are much more powerfully affected by impressions on the superjacent surface than in the state of health. The same is doubtless the cause of the severe pains felt in ulceration of the cartilages when the articular surfaces are pressed together.

There does not seem, *à priori*, any reason to suppose that division of the vagi nerves would do away with the sensation of hunger, and this seems also fairly to be concluded from the experiments that have been performed. Both Reid and Longet found that animals which survived the first effects of the operation exhibited signs of hunger. The former observer writes: "Few of the dogs we operated on took food for the

first twenty-four hours; and, after all the coaxing we could practise, this was always in sparing quantities. Of the four dogs which lived beyond the fifth day, three cocked their ears, and looked out for food when we entered the room, after they had fasted for several hours; and the quantity of food they took was variable at different times. In fact, we could not observe anything which would lead us to believe that they had lost the sensations of hunger and satiety." A young cat, whose vagi I divided, did not seem in any way particularly affected for two days; during two more she appeared to be extremely thirsty; she lapped up milk eagerly, and soon vomited it up again, coagulated partially and acid. When she had exhausted her supply of milk, she got at a bowl of dirty water that was in the room, and kept lapping at it, and very soon after vomiting it up again, with muco-watery, distinctly acid fluid. She did not take any solid food. This experiment shows clearly that the sensation of thirst may be experienced intensely after division of the vagi. As the stomach receives numerous nerves from the divisions of the solar plexus accompanying the arteries, it is very comprehensible that the loss of the vagi should not abolish the sensations which originate in it. Experiments sufficiently extended have also clearly proved that the function of digestion is not destroyed by section of the vagi. The first effect of the operation is indeed almost invariably to cause vomiting, loathing of food, and interruption of the digestive process. If, however, the animals survive beyond the fifth day, the digestive faculty is unquestionably regained. Dr. Reid found that food taken disappeared in the alimentary canal, that acid

chyme was formed, and that the lacteals absorbed chyle. In one instance, an animal at the time he was killed was "rapidly gaining in flesh and strength." Other experimenters have obtained similar results, as quoted by Dr. Reid, of which the most striking is that detailed by MM. Leuret and Lassaigne, who observed a horse to take food, with appetite, immediately after the division of the nerves, and found chyme in the stomach, and normal chyle in the lacteals, when the animal was killed eight hours after.

It does not appear that the mucous membrane of the stomach suffers in its nutrition, or becomes inflamed, from division of the vagi. With the lungs, as it is well known, the case is very different, most of the animals operated on dying with more or less extensive œdema and consolidation of the pulmonary tissue. The chief cause of this is, no doubt, the great diminution which takes place in the frequency of the respiratory movements, in consequence of which the passage of the blood through the lungs is retarded, and stagnation takes place. While, however, the proper vesicular tissue of the lungs is congested, inflamed, or consolidated, the mucous membrane of the bronchi suffers much less, as Dr. Reid testifies. It does not appear, then, that any change takes place after the division of the vagi, similar to those which are observed after division of the fifth pair of nerves. In the instance which I have above related, when the animal was killed, four days after death there was no morbid condition observed in any part. The lungs were quite pale and free from congestion or effusion, the bronchi were in their usual state; the stomach (which I had expected to find inflamed, from the great

thirst and vomiting) was quite healthy, its mucous membrane perfectly pale and moist, with its tubes, as shown by microscopic examination, absolutely normal. The liver was congested, the gall-bladder and ducts loaded with dark bile, some of which was also observed in the duodenum, and for some way down the empty intestines. Though the vomiting had been so severe that she brought up a lumbricoid worm, no bile was found in the stomach. The great differences observed in a series of experiments performed in precisely the same manner by the same operator, and upon the same kind of animals, are very interesting, and significant, I think, of an important practical fact. This is one well known to the physician, and which, at times, occasions him no little disappointment. Cases which appear to all observation similar, and equally likely to be benefited by the same remedies, are yet found to be very differently affected by them. To one patient the drug may be almost poisonous, which to another is a means of health. No doubt, in some instances, want of success may proceed from faulty or deficient observation; there exist differences which might have been detected. In others, however, there is no ground for self-reproach; the tissues visibly similar, and acting similarly, yet differ greatly in some important qualities which none can test and foretell. How differently will a dose of opium act in different persons!

The action of *vomiting* may be excited, either by various irritants directly applied to the mucous surface of the stomach, or by certain substances circulating in the blood, as tartar emetic when it has been injected into a vein, or by irritation affecting various parts of

the brain. Nothing is better established than the fact that vomiting is produced through the medium of the nervous system. If this be in a state of stupor, no emetics will produce any effect. Dr. Paris mentions a case of poisoning by belladonna, in which fourteen grains of potassio-tartrate of antimony produced no effect; and I have myself vainly endeavoured to excite vomiting by the same drug in a child whose blood was loaded with carbonic acid from bronchitis. Much dispute has been carried on as to the muscular organs which are the effective agents in causing vomiting; some affirming that the stomach is passive, and merely undergoes compression by the abdominal muscles and the diaphragm; others maintaining that the contraction of these voluntary muscles is only subordinate and auxiliary to that of the coat of the stomach. To me the latter opinion appears the more correct, and it has the following strong evidence in its favour. A person may take a deep inspiration and maintain it, so as to keep the diaphragm lowered and contracted, while, at the same time, he strongly contracts his abdominal muscles; yet this voluntary compression of the stomach will not produce vomiting, even though the stomach be distended by a pretty full meal. Again, an instance is on record, related by M. Lepine,* which proves that the contraction of the stomach is perfectly adequate to effect the expulsion of its contents upwards. A man's abdomen "was torn open by a horn, and the stomach was wholly protruded. For half-an-hour it was seen repeatedly and forcibly contracting itself, till, by its own efforts, it expelled all its contents except the gases." If violent contrac-

* V. Paget's Report, 1845, p. 274.

tions of the abdominal muscles could produce vomiting of themselves, it would surely occur during the latter stage of parturition, when the abdominal cavity is still occupied by the distended uterus, and the straining muscular efforts are so powerful. To me the simultaneous contractions of the diaphragm and abdominal muscles seem to bear the same relation to those of the walls of the stomach, that they do in the case just cited to those of the uterine muscles. The sensations, also, during the act of vomiting, are entirely those of an internal completely involuntary effort, quite unlike any that can be at all modified by the will. Eructation can be produced voluntarily by contraction of the diaphragm and abdominal muscles, but is unattended with nausea or the peculiar sensations which accompany vomiting. Dr. Todd and Mr. Bowman express their opinion "that there cannot be complete closure of the glottis in the effort of vomiting," because "that act is frequently accompanied by a loud explosive noise, which must be formed in an open, although a resisting, glottis." To this I rather demur, because it seems very possible that the explosive noise might proceed from air rushing up the œsophagus; and because the very contact of the matters expelled with the aryteno-epiglottic folds would, as in deglutition, be sufficient to cause the closure of the glottis. Mr. Paget has well pointed out (*loc. cit.*) "that a condition essential to vomiting is the relaxation of those oblique fibres of the stomach, which, like a sphincter, embrace the cardia. Unless it be relaxed no vomiting can take place; for, when contracted, they can as well resist all the force of the contracting expiratory muscles, as the muscles of the

glottis can resist it in the act of straining." It has generally been supposed that the natural mode of contraction is reversed in vomiting, that an antiperistaltic action is set up. This, however, is shown by the observations of Dr. Brinton (*loc. cit.*) not to be the case. He states that "in an animal killed during repeated and copious vomitings, the movement was seen to be distinctly forwards, having a considerable general resemblance to that of the earlier stage of digestion." There is no doubt that if the pylorus were firmly closed, the contraction of the stomach would drive its contents through the cardiac orifice, supposing this to remain open.

The effects of vomiting seem to be generally to promote the flow and the elimination of the various secretions; but it is not easy to decide how much of the effect produced is to be ascribed to the general action of the emetic substance itself, and how much to the local action which it provokes. The influence of ipecacuan and tartar emetic is certainly exerted more upon the system generally than upon the stomach alone; yet it is found that emetic doses of these drugs have a much more beneficial effect in croup than merely nauseating ones. M. Valleix, quoted by Dr. West, states that in thirty-one out of fifty-three cases of true croup, where emetic doses were given, fifteen recovered, while in the remaining twenty-two, where they were used more sparingly, only one recovered. Emetics of sulphate of zinc and sulphate of copper have a decidedly stimulating action, effective sometimes in the collapse of cholera; which complicates the general result as much as the lowering tendency of those before named. In sea-sickness I

have noticed very positively the great outflow of bile, which takes place conjointly with the vomiting, and passes down the intestine, producing large bilious evacuations. In vomiting from cerebral disease I have observed the rejection of much bile, together with copious mucous and watery fluid. In the porraceous vomiting of peritonitis the same occurs. Bronchitic patients, after an emetic of ipecacuan, declare that they find their chests greatly relieved and freed from a quantity of phlegm, in a way that they certainly do not experience after taking small doses of the same substance. Dr. Darwin, quoted by Pereira, mentions the case of a man who vomited six pints of liquid, though he had only swallowed one. These facts are sufficient to illustrate the influence of the act of vomiting in promoting the flow of secretions. The force of the circulation is decidedly lowered by the action of an emetic: a degree of languor, a disposition to sleep, and a general moisture on the skin, are enumerated by Dr. Paris as the final results of its action. In consequence partly of the sedative effect on the excited circulation, some remarkable arrests of morbid action are occasionally produced: thus, a severe attack of tonsillitis, or of orchitis, has been almost cut short; and even a bubo, as John Hunter states, has been dispersed by an emetic. In these instances, I believe the principal part of the fortunate change proceeds from the induction of a different and more healthy mode of nutrition in the affected parts; and this is brought about through the intermedium of the nervous system.

It is a consideration of some importance and interest whether emetics act as excitants only of the muscular

coat of the stomach, or whether they cause vascular irritation in the mucous membrane at the same time. Dr. Paris refers to a case in which a very large dose of sulphate of zinc, given to excite vomiting in an epileptic patient, produced fatal gastritis. Most irritant poisons, as is well known, have an emetic action. It seems, at least, very doubtful whether ipecacuan, or tartar emetic, cause any vascular irritation of the stomach. Of the former, Dr. Pereira says, "its operation is exceedingly safe, since inflammation is not produced by it, even where an over-dose has been swallowed." An experiment which I performed is quite corroborative of this statement:—An adult cat was dosed with fifteen grains of powdered ipecacuan, which produced vomiting. She was killed about one hour after. The mucous membrane of the stomach was perfectly pale; under the microscope it was found to be quite healthy in structure, and to be covered by its columnar epithelium. In two other cats, I tried the action of tartar emetic. To the first, a kitten, I gave one dose of a quarter, and afterwards half a grain. She became violently sick, and brought up a clear mucous fluid, with some acid remains of half-digested food. She was killed soon after. On examination, the stomach was found pale and empty, containing a little bilious-looking fluid near the pylorus. Its mucous surface was still invested by its columnar epithelium, and the contents of the tubes were natural, though they formed large masses, rising up out of the fossulæ. There was a good deal of mucous and watery exudation from the intestinal surface. The second animal was adult, and had two doses of half a grain each given her at an interval of one hour

and a half. The first dose vomited her strongly, and produced a loose clayey stool; after the second she was found dead. There was found great congestion of the large veins of the right cavities of the heart, and of the pulmonary artery and its divisions. The left ventricle of the heart was well contracted. The lungs were not inflamed, but the quantity of epithelium lining the air-cells was greatly increased. Death seemed to have resulted from paralysis, or debility of the right side of the heart. The stomach was empty, and its mucous surface pale, covered with mucous and watery exudation, and in some parts by a bright yellow bilious fluid. The columnar epithelium was shed, and lay in a mucous fluid; the tubes appeared as usual. The surface of the duodenum and upper two feet of the small intestine was covered with a deeply bile-tinged mucous fluid; the rest of the small intestine presented an abundant, pale, watery, mucous exudation. The large intestine contained some fluid faecal matter, but not the watery and mucous effusion of the small. Microscopic examination of the duodenum showed the capillary plexus of the villi considerably injected just at the apex along the margin, while the epithelial investment was lifted off by an abundant exudation of homogeneous and granular fluid, containing also numerous rather large mucous corpuscles. The villi of the upper part of the small intestine were in nearly the same state. There was nothing remarkable in the Lieberkühn follicles. Large quantities of mucous matter had been thrown off also from the surface of the gall-bladder and bile ducts, so as to render the bile very tenacious. For some other details of this experiment I refer to a

paper in the *Medical Times* for March 19th, 1852. In both these experiments the stomach was found quite free from any traces of congestion, although in the second these were very manifest in the small intestines. The influence of the drug in promoting mucous and watery exudation was very apparent.

I am much inclined to agree with Dr. Beaumont in the view which he propounds respecting the sensation of hunger, viz., that it is produced by a distension of the apparatus which secretes the gastric juice. Not that I am able to state that I have found the stomach tubes remarkably filled by their epithelium when the animal had been fasting for some time, for the alteration in the condition of these structures might be one rather of a qualitative than quantitative kind; or, even if it were the latter, it might be scarce perceptible in each separate tubule. But the circumstances that the sensation of hunger has (which cannot be doubted) its chief seat in the stomach itself; that it is almost immediately allayed by the ingestion of aliment, long before that aliment can be supposed to be absorbed; and that, as Dr. Beaumont observed, the mere contact of the food with the mucous surface causes the immediate flow of a quantity of gastric juice, go far, in my judgment, to demonstrate the correctness of his opinion. Analogy seems also to favour it. We know that the secretions of the liver, the kidneys, the testicles, are being constantly formed and stored up in their proper receptacles; that of the salivary glands is slowly poured out, even in the intervals of mastication; and scarce any, except that of the pancreas, seems to be wholly suspended for any, even a brief, period. But even where, as is the case of the

latter gland and the stomach, there is no outflow of secretion for some time, it seems almost certain that a preparative process of some kind must be going on in the glandular tissue ; for, after a certain period of rest, a quantity of secretion can readily be collected on the application of a stimulus ; but the amount which the gland will yield is by no means unlimited. Dr. Carpenter's supposition that the cause of hunger is a certain condition of the capillary circulation in the walls of the stomach, appears to be sufficiently refuted by the known fact that the mucous membrane receives much less blood when it is in a quiescent state than when it is digesting. The capillary vessels being certainly less filled in the intervals of than during digestion, cannot need to be "unloaded." It is scarcely necessary to remark that the sensation of hunger is very distinct from that of general exhaustion ; the latter, of course, goes on increasing the longer food is abstained from ; the former requires a certain amount of strength and vigour in the system. A person may easily be too tired and exhausted to feel hungry. The extreme craving which is felt when the system has been very long without food is probably a compound sensation, made up partly of impressions derived from the stomach itself, and partly of others of a more diffused and general kind. *Thirst* seems to be more dependent on the condition of the general system than hunger ; but there is no doubt that it is very often caused by morbid changes in the stomach, especially those of an inflammatory nature. Though the sensation is more referred to the throat than to the stomach, the following observation proves that the

latter is its more real locus.* A man who had cut through his œsophagus suffered so great thirst that he swallowed daily several buckets full of water, which ran out of the wound, but the thirst was unquenched. It was afterwards allayed by the injection of spirits, diluted with water, into the stomach.

* Case by Dr. Gairdner: Edin. Med. and Surg. Journal, vol. xvi. p. 355.

CHAPTER III.

PATHOLOGY.

MORBID CONDITIONS OF THE STOMACH.

(I.) *Passive Congestion.* The slighter degrees of this state are frequently met with, the more extreme are not common. One cause of this is that the congestion, when carried to a great degree, is apt to relieve itself by the discharge of blood, by which the vessels are emptied. It is very difficult, from mere post-mortem examination, to pronounce whether the congestion before us is accidental, or the result of diseased action during life. The history of the symptoms, of the vital phenomena, will give much better information. Andral, who has studied the subject very carefully, states that all the various forms which vascular injection can present when it is the result of inflammation, may also be of mere cadaveric origin. Thus, the surface of the stomach may exhibit fine arborisations, capillary or ramiform networks, a uniform red, brown, or black colouring, or even effusions of blood on the free surface of the mucous membrane, or beneath it. The causes of passive congestion are the same in the case of the stomach as in that of other parts; they all are referable to obstruction of the onward current of the blood, or to atony of the vessels. Whether the impediment exist in the lungs

or in the liver, the effect upon the stomach will be the same. Congestion from atony of the vessels, without any obstruction, does not attain a great degree; it is mostly observed in the splenic region after death from enfeebling diseases. The muscular coat is generally much relaxed, and the congestion extends to the vessels in the submucous tissue. The following cases illustrate the production of congestion, the condition of the tissue affected, and some of its results. Case 1. —D. C., male, æt. 49, admitted into St. George's, Dec. 7th. He complained of palpitation and dyspnoea, from which he had suffered since June. Never had suffered from rheumatism, had no previous illness, could not account for his symptoms, which had come on quite gradually. Pulse sharp, hammering; a distinct double bruit at base of heart, which was enlarged, and its action increased. Urine scanty, loaded, albuminous. Breathing soon became very laboured, there were moist and sonorous râles in lungs, the breathing got worse, and he died on Dec. 15th. Post-mortem twenty-four hours after death. Integuments generally anasarcaous. Much yellow fluid in the left pleura, compressing the lung; a largish patch of thickening on the visceral pleura of this side. Right lung emphysematous, and some extravasation of blood in it. Heart very large, white patch on its surface, walls of ventricles somewhat thickened. Valves natural, except slight thickening and opacity of the mitral. Commencement of aorta exceedingly thickened, and indurated by calcareous and atheromatous deposit. Liver very large, its edges rounded, a white patch in its capsule. Spleen congested, its capsule thickened. Kidneys large and heavy, but with smooth surfaces;

one or two light-coloured horny deposits in their pyramids. Blood generally very fluid. Examination of stomach:—On laying the cavity open, the whole mucous surface was found of a dark, deep, blackish red, which soon became brightened by exposure to the air. The cavity was quite empty and contracted, the mucous membrane thrown into deep rugæ, between which there lay a small quantity of alkaline fluid mucus. This consisted of columnar and tubular epithelium. There was no mucus whatever covering the rugæ. In vertical sections the glandular tubes of the splenic, mid, and pyloric regions were found quite healthy, and there was no interstitial exudation. The whole of the vessels, however, were thoroughly filled with blood; not only the larger vessels surrounding the orifices of the tubes on the surface, but also the long delicate capillaries running between and parallel to the tubes, and the straight vertical veins into which the capillaries open. At the surface there were numerous spots of commencing extravasation of blood, which appeared to extend for a little depth below the basement membrane, but had not ruptured its texture (*vide* fig. 30). More extreme congestion than existed in this case cannot be conceived. The absence of exudation in the gastric tissue, the fluid state of the blood, the dilatation and hypertrophy of the heart, the compression of one lung, and the extravasation into the other, the enlarged and cirrhotic condition of the liver, all make it certain that the extreme repletion of the vessels was from obstruction to the onward current of the blood, and not from active determination to the stomach. It is also pro-

bable, from the absence of symptoms, that the congestion took place during the last hours of life. The alkalinity of the mucus between the rugæ, probably depended on the exudation of some serum from the blood-vessels. Case 2.—C. D., æt. 37, admitted into St. George's, May 17th, was attacked by hæmatemesis the morning of his admission; during the preceding week he had been bilious, and had vomited frequently; he never had pain in his stomach, but a sensation in the throat, from whence the blood seemed to come. Much blood was brought up the afternoon and night subsequent to his admission; his face was pale and his movements tremulous; he had no cough, no pain anywhere. He died exhausted May 18th. Post-mortem:—Body in good condition; old pleural adhesions on right; lungs congested, and bronchi; the latter contained some blood-tinged mucus. Heart natural, except some slight sanguine extravasation beneath the endocardium of right ventricle. Stomach and intestines to all appearance quite natural; no vascularity was observed, and no abrasion; but a largish-sized clot of dark blood was found lying in the stomach, which had stained the membrane on which it lay.

The liver was very large, with a rough granular surface, and a very firm knotted sectional surface of a yellow and brown party-colour. Gall-bladder contained much tarry bile. Kidneys slightly indented on their surface, and the marks corresponded to cicatrix-like seams in their cortical parts, which latter were in some parts diminished. Capsule of spleen slightly thickened, and slight amounts of fibrine were collected in the divisions and marks upon its surface; in some places these were changed into firm opaque patches;

its substance was natural. The other abdominal contents were natural; muscles generally very pale. Microscopy:—Thin sections of the liver showed immense thickening of the Glissonian sheaths, from the presence of new-formed fibroid tissue loaded with numerous round and some elongated nuclei. The quantity of this tissue was much more abundant in some fissures than in others, and hence the parenchyma was divided into masses of very various size. There was much difference in the condition of the cells; some were quite natural, some laden with oil, others with oil and yellow pigment. The existence of congestion of the gastric mucous membrane in this case, is marked by the history of so-called bilious sensations and vomitings during the week previous to the fatal hemorrhage. This drained the mucous membrane so effectually, that after death it was found quite pale. The obstruction was manifestly in the liver. In this organ fibroid formation had been taking place to a great extent, and there were also traces of it in the spleen and the kidneys. These, in my belief, were not produced by any chronic inflammation, but by a peculiar diathesis. Case 3.—E. A. S., female, æt. 13, admitted into St. Mary's, Aug. 15th. Was quite well until three months since, when her legs and feet began to swell, and were so fourteen days; after the anasarca had gone she had pain in the left side, and palpitation. She worked harder than usual before her illness. Cough and sanguineo-mucous sputa until last month. Much loss of flesh; appetite good. There was a loud systolic mitral bruit. She improved under treatment, and went out; but immediately relapsed, and was readmitted Sept. 21st, having much cough and palpi-

tion. 23rd, a severe attack of bilious vomiting. Oct. 1st, complains of weight and pain at chest after food. Pulse irregular. Oct. 12th, sickness again; matter vomited yellow and thick. Oct. 15th, constant pain and weight at chest after everything that she takes. She was put for a short time on a diet of milk and lime water, and on 18th had no more sickness, and was hungry. 21st and 22nd, the sickness recurred. Nov. 8th, Sodæ Hyposulph. *፻j ter die* was given with some benefit; afterwards Spt. Ammon. Co. *ʒfs ter die*, for a sour taste which distressed her. Nov. 11th, urine very albuminous, not at all so on Oct. 20th, of sp. gr. 1029. Legs swollen. She sank and died Nov. 25th. Post-mortem:—Body universally anasarcaous, very pale. Patches of extravasation, and others of great congestion in the right lung. Left lung much compressed by the greatly enlarged heart; there was much less extravasation in its tissue, and much less congestion. Pericardium adherent throughout. Mitral valve not materially thickened, to all appearance efficient. Aortic and right valves healthy. Kidneys appeared healthy. Liver gorged with blood, large but healthy-looking. Stomach:—the mucous surface was covered with a considerable quantity of dark grumous matter, evidently digested blood. Under the microscope this was seen to contain a very large proportion of diffused granulous yellow pigment, which was here and there aggregated into masses, as well as very numerous sarcinæ, many of them of small size, consisting of two to four segments. There was a good deal of emphysema in the submucous tissue of the splenic region, the tubes in this part were very tolerably healthy, though occasionally some dark pig-

ment was observed in the epithelial particles. Mid region; tubes quite healthy, but the epithelium is rather fatty. Pyloric region; tubes perfectly healthy. I believe that in this case the presence of the sarcinæ had little to do with the symptoms which depended (so far as the stomach is concerned) on congestion of cardiac origin. This told in the direction backward on the lungs, liver, and stomach successively, producing in the latter the mal-digestion, and vomiting, and pain after food, which occurred so often. The congestion was much relieved by abstinence from solid food. It is probable, as there is no mention made of any dark matter having been vomited, that the effusion of blood took place towards the close of life, and was converted into yellow pigment by the acid then present in the stomach. The emphysema in the submucous tissue was not the result of putrefaction, but was a true pneumatosis, such as is often observed when hemorrhage has taken place.—Case 4. H. Q., æt. 26, male, single, admitted into St. Mary's, June 5th, 1853, under Dr. Sibson. He had only been ill about two days with rheumatic pains in one knee and elbow. There is no history of any previous disease. He went on in about the same way till 23rd, when the left shoulder was swollen; he did not sleep well, and sweated much. July 4th: Left hand and fingers swollen and yellow-tinged; the pain in shoulder increased and extended down the arm; hand tremulous. 20th July: Has some singing in ears and headache. 22nd July: Has been sick all night; countenance much changed; matters vomited quite green; hic-cough every three seconds. He became much prostrated; the pulse very feeble; voice almost whisper-

ing. The vomiting continued, and the hiccough, with little intermission, until his death, which took place on the 26th. The matters vomited for several days were thick and green; but, latterly, blood was brought up. Repeated small doses of calomel were given during the last few days of his life. The bile did not seem to have passed in the natural manner along the intestine. Post-mortem:—Body wasted; left lung firmly adherent at apex, and there cicatrized; right lung adherent by its midlobe to thoracic walls, and also anteriorly to pericardium. Both lungs particularly firm and congested, and of dark colour; right lung there semi-consolidated, and its apex containing a small mass of cretaceous matter; heart healthy; liver firm, somewhat contracted, and very considerably deformed by the contraction of interstitial exudation, drawing the surface in along lines, between which it remained prominent. There were very numerous bands of false membrane on the surface. On cutting into its substance it was found very pale and fatty looking, and here and there were numerous masses of whity, clayish aspect, slightly ramified, and with clavate terminations. The weight of the liver was 3 lbs. 3 ozs. The circulation of blood in the liver was not apparently obstructed. The stomach contained much dark, coffee-ground fluid, of faint acid reaction. Its mucous lining, as well as that of the duodenum, presented many red, highly-congested spots, scattered everywhere over their surface. The rest of the intestines, downward, contained much dark, greenish fluid, but presented no ulcers or other morbid appearance. Kidneys healthy and of normal size. The larger hepatic ducts, and several of their branches, were coloured

deep yellow by bile ; the smaller ducts were mostly pale. A small distoma was found in one duct. The cells of the liver were generally very fatty, the Glissonian sheaths were but little thickened. The whitish masses were found under the microscope to consist of nuclear particles, small granular globules, much granulous and oily matter, and many glistening bodies of very elongated diamond shape, with truncated edges. I regarded them as distended terminations of ducts, from their often presenting a central cavity, with a membranous wall, from their ramified shape, and their general resemblance to the so-called knotty tumours of the liver. The mucous membrane of the stomach was of a darkish colour, its capillaries were in some parts strongly injected ; the tubes in the portion examined were healthy. The point which this case illustrates is, that disordered secretory action in the liver may induce congestion of the stomach (as well as of the intestines), which may proceed to the extent of hemorrhagic effusion. Several cases are cited in Dr. Budd's work on diseases of the liver, which fully corroborate this view. In the case of Mrs. Diprose, whose duct. com. choled. was completely closed, vomiting of blood occurred three or four times about a week before her death, yet there was no disease of the stomach or intestines. In cases 1 and 2, quoted from Dr. Graves' work, and communicated to him by Dr. Hanlon, it is mentioned that the matters vomited were like coffee-grounds, which is equivalent to saying that they were bloody. The locus of diseased action in these instances was the liver, whose secretory action was utterly abolished, and its healthy structure destroyed. The case quoted

from Dr. Abercrombie is of the same kind, the liver being found very dark, and, internally, soft and disorganized, the gall-bladder empty, while the stomach and intestines were quite healthy in appearance, except that they contained a considerable quantity of black matter, similar to that which had been vomited. The explanation of the congestion in these cases seems to be, that, according to the important physiological law now pretty well recognized, the freedom of the transit of the blood through any part is, in great measure, dependent on the healthy performance of its function; so that, if the function be arrested, the circulating current is arrested also. Thus, when apnœa is taking place, the blood no longer passes freely through the lungs, but is thrown back on the right side of the heart, and on the venous system, which is sometimes gorged by it to an extreme degree. I think this pathological influence of the liver upon the stomach is far from uncommon, and shall touch upon the subject again,* under the head of clinical observation. Case 5.—J. G., æt. 53, male, admitted into St. Mary's, July 19th, 1852, with dyspnœa and anasarca, and a distinct systolic mitral murmur. The liver descended three inches below the ribs, and he said that he had pain in that situation for some time, increased by lying on the right side. Effusion took place in both pleuræ, to a great amount in the right. However, he got better, and went out early in October. He was admitted again December 16th,

* A female, with considerable ascites, now under my care in St. Mary's, (by the kind permission of Dr. Chambers,) has had several times vomiting of bloody mucous fluid. The cause of this is doubtless congestion of the mucous membrane. Marked relief to this state has been afforded more than once by moderate doses of calomel given so as to act on the liver.

1853, and stated that dropsy had come on during the last two weeks. His face was purple and congested, his breathing short and wheezing, his pulse irregular and weak. The heart beat in the epigastrium; its action was very irregular. There were large crepitations in the base of the right lung, sibilant and sonorant noises in the left; the veins of the neck were distended; urine deep coloured and clear; sputa dark. 28th: Liver felt to be enlarged. He got worse, and sank January 1st. Post-mortem:—Body universally jaundiced; anasarca of legs; much yellow serum in peritoneum; heart very large—weight $22\frac{1}{2}$ ozs.; a white patch on surface; valves healthy, except a little atheroma in the mitral; patches of opaque thickening in the endocardium of left ventricle. The cavities of the heart were enlarged; lower lobe of left lung much compressed by abundant pleural effusion, amounting to 64 ozs., upper lobe pretty healthy; right lung everywhere adherent by old thickened attachments, except below and behind; compressed, highly congested; its upper lobe broke down easily on pressure. Capsule of liver much thickened; the parenchyma yellow, dense, and firm. Kidneys appeared tolerably healthy, except that they were unduly firm: there was a large cyst in one. The stomach contained a large quantity of whitish, pulpy acid ingesta. Microscopy: Muscular tissue of heart slightly fatty. In the liver, the Glissonian sheaths were found very considerably thickened, with fatty transformation, atrophy, and breaking up of the cells of the lobules, which were involved to some extent in a fibroid stratum. In the kidneys, the cortical and medullary tubes were not broken up, but their epithelium was

often fatty—sometimes from diffused oil molecules, sometimes from glomeruli being present; the interstitial matrix also seemed to be obscured by a granular infiltration. The surface of the stomach in the splenic and mid regions was very dark, almost black in some spots; the rugæ were but feebly marked. Splenic region: Tubes almost utterly broken up and reduced to a mass of nuclei and granular globules, mingled throughout with black pigment globules. This change seemed to be a simple disintegration, there was no nuclear or fibroid formation, the tubular tissue was simply degenerated and broken up, and loaded with black pigment. Mid region: Tubes in a very great degree broken up, and their place occupied by diffused nuclei and cell-stuff, with pigment. No nuclear deposits were seen. The basement membrane of the surface was very distinct in both splenic and mid regions. Pyloric region: The villi were beautifully distinct, with their covering of basement membrane; but the tubes were utterly obscured, if not destroyed, by circumscribed and diffused nuclear deposits. There was no pigment in this part. The condition of the heart, of the lungs, and of the liver, makes it highly probable that congestion of the stomach had existed for a considerable time. This gave rise to two results: on the one hand, by impairing the nutrition of the tissue, it occasioned the disintegration of the tubes; and, on the other, it caused the production of pigment, as the hæmatine frequently exuded from the gorged capillaries, and underwent its usual change. Dr. Budd, in his lectures upon the organic diseases of the stomach, has illustrated very well the effects of passive congestion on different organs, in impeding the discharge of

their functions, and impairing their nutrition. This had been done previously, also, by Professor Simon, who, referring to one of the best instances of this condition, viz., the formation of a varicose ulcer on the leg, says, "It is true that much blood is contained in the affected tissue; but it is blood that has insufficient means of renewing itself; and, from its long detention in the part, it acquires in an extreme degree the character of venous blood. Thus, as regards mere bulk of blood, the part is over-supplied; but, in respect of the quality of blood, it may be said to suffer what is equivalent to *anæmia*: accordingly, the elements of its texture fall into a state of atrophic softening, which terminates in the formation of an ulcer."

Case 6.—R. F., *æt.* 49, male, admitted into St. Mary's, February 24th. He had been in India, been wounded several times, had several attacks of fever, and two "touches" of cholera. Was a drunkard, and a very hard liver. Had an attack of dropsy last year, from which he recovered, but it returned again this winter. Urine of very deep colour, and slightly albuminous, *sp. gr.* 1017; distinct *arcus senilis*; jaundiced tinge of skin. He got lower and weaker, took little nourishment, and died March 5th. *Post-mortem*:—Body had a good deal of subcutaneous fat; some amount of general *œdema*; numerous cicatrices on legs. Both lungs *emphysematous* anteriorly, and generally *œdematous*; left everywhere *crepitant*, right more consolidated. Large quantity of fluid in both *pleuræ*; most in right. Heart large, covered with fat externally; left ventricle hypertrophied, walls thickened; mitral valve thickened at margin, tricuspid, also, very slightly. Other valves healthy. Liver

pale, exceedingly fatty, weighed 4 lb. 5 oz. Kidneys not shrunken, surface granular, weighed each 6 oz. Stomach was highly congested in the splenic and mid regions, especially at the free margins of the rugæ; there was much chocolate fluid in the cavity of alkaline reaction. Pyloric region palish, but presents at the lower part of great curvature some remains of zones of injection, surrounding small pale areas; also, some dotted injection. Splenic region: Trunks and capillaries much injected; tubes very healthy. Mid region same. Pyloric region: Tubes much atrophied and obscured by interstitial, nucleated fibroid formation, basement membrane destroyed. Duodenum: Tissue healthy, but much congested. In this case there seems to have been no cause of an obstructive kind to account for the gastric congestion, and I believe it to have originated in simple atony of the vessels. This is the more probable, since the man died of prostration and debility, chiefly brought on by his vices and excesses. The chocolate fluid was altered blood, and the alkaline reaction no doubt proceeded from the serum of this fluid.

No further comment on the above cases seems necessary, except to remark that though we have cited various efficient causes of congestion, and several of its effects, yet it must not be concluded that the same causative conditions will in all cases produce the same results. For instance, the obstruction in cirrhosis of the liver tells much more constantly on the subserous capillaries than on those of the mucous membrane, and thus ascites is a much more frequent symptom of this state than hæmatemesis. In a man who died under my observation, with an enormously hypertro-

phied and dilated heart, the aortic orifice being patent, and dropsy having existed for some time, the mucous membrane of the stomach was found pale, and its tubes everywhere tolerably healthy. The reason why such differences are observed under the operation of similar causes is to be sought in the different original endowments of the tissues in the several cases. One organ will yield and suffer injury, or become the focus of morbid action, in one person, which would escape or be much less affected in another, because its tissues are naturally possessed of a stronger and more persistent vitality. This is matter of common experience ; few have not some weak point physically, as well as morally.

(II.) *Inflammation*.—This occurs in two forms, the typical instances of which are sufficiently distinct from each other, though there may be many intermediate degrees which partake of the characters of both. They correspond to Cullen's two forms of enteritis, E. Erythematica, and E. Phlegmonodea. The former is correctly termed catarrh by Rokitansky, the latter closely resembles dysentery. I propose to speak of the one as *catarrh*, or *catarrhal inflammation* ; of the other as *gastritis*, intending thereby an inflamed condition of the whole substance of the mucous membrane, and not of its surface only. Catarrhal inflammation is exceedingly common : it occurs under the same influences as catarrh of the air-passages, or conjunctivitis, and often either co-exists with these affections or succeeds them. Its anatomical characters are—distension of the capillaries, especially of the surface with blood ; and secretion, often very abundant, of an extremely tenacious, clear, or whitish,

or bile or blood tinged mucus. At the commencement of the disease, or during exacerbations, the hypercœmia is a marked feature; the presence of abnormal mucus, however, is a much more constantly observed and certain character. Congestion of a passive kind powerfully predisposes to catarrh, and is very commonly conjoined with it, but by no means necessarily. Watery or slightly mucous, feebly acid or neutral, fluids are often secreted in gastric catarrh, resembling in their appearance very much the analogous effusions in bronchial catarrh. The fluid rejected in pyrosis is manifestly very similar to that which is expectorated in bronchorrhœa. Rokitansky enumerates a dark or slaty discoloration of the mucous membrane among the alterations characteristic of catarrh. There is no doubt that it is often observed in this state, but I think it more peculiarly belongs to gastritis, where the substance of the mucous tissue becomes saturated with exuded hæmatine, which undergoes conversion into black pigment. He also describes a thickened or hypertrophied state of the mucous membrane as of frequent occurrence, and especially includes in it the mammellated condition, as well as certain permanent or polypoid folds. Thickening also, according to him, often extends to the submucous and the muscular coats,—“the entire parietes of the stomach presenting unusual thickness, firmness, and hardness.” Such changes I have certainly not observed in the cases I have examined; mammillation, indeed, sometimes is present, but by no means constantly, and it is very marked in other instances where there is no catarrh. The mid and pyloric regions are the parts principally affected by catarrhal

inflammation, which, as we shall see, is not the case in gastritis. The mucus which collects on the surface, and adheres very closely to it, so that it is with difficulty removed, consists essentially of an extremely tenacious homogeneous-granular plasma, in which lie free nuclei, often very numerous, together with remains of columnar particles, and large round or oval cells from the tubes. The latter are not unfrequently absent, either not having been detached, or having been broken up into granulous matter. Blood globules or pigment grains, derived from their decomposition, are sometimes seen in the mucus, and also imperfectly formed crystals of triple phosphate. I have never been able to find true mucous or pus corpuscles in the gastric mucus, although it is by no means uncommon to find composite nuclei, such as are brought into view in these structures by acetic acid, lying in great numbers in the plasma of vomited mucus. I am inclined to think that these are derived from corpuscles generated in the mucous glands of the pharynx or fauces. I doubt that the action of the acid upon the original nuclei can effect this change, as I have not found it produced when strong acetic acid was added to mucus containing numerous nuclei. It is certainly remarkable that catarrh of the urinary bladder or of the bronchi should so quickly cause the production of pus corpuscles, while in the gastric cavity this does not take place. The presence of cells from the tubes in numbers in abnormal gastric mucus shows that the irritation has extended to them, and has caused their epithelial contents to be thrown off in greater quantity than would naturally have taken place. When a layer of tenacious alkaline mucus is

spread over at least half the surface of the stomach, it may be well conceived what an impediment it must be by its mere presence to the digestion of the food. Even if the subjacent membrane be capable in any degree of pouring out healthy secretion, this viscous covering must prevent it coming into contact with the ingesta. The circumstance that the pyloric region is an especial locus of catarrh is partly explained by the nature of its follicles, which, as before described, differ notably from those of the other regions, and approach much nearer to the condition of simple mucous follicles. This makes it a less deviation from the state of health that they should secrete mucus. But when the mid region is also covered entirely or in part with abnormal mucus, it is manifest that a great change must have taken place in the action of its tubes, debasing their epithelial contents more or less from their function of furnishing the essential digestive principle, to that of heaping up an useless and inert, if not mischievous product. This, of course, assumes that the follicles are, for a greater or less depth, engaged in the morbid process, which, I think, can hardly be doubted.

The following table shows the number of times that the catarrhal condition was found after death in a series of 100 cases taken indifferently. It also exhibits the co-existing morbid changes of other parts, and those of the stomach itself. The numbers in the first row correspond with those in the table printed in the "Med. Chir. Transact.," 1854.

NO.	AGE & SEX.	PRINCIPAL MORBID STATES.	CONDITION OF STOMACH.
10.	— 64. M.	— Calculi in bladder, which was ulcerated — peritonitis.	— Tubes tolerably healthy, rather wasted.
11.	— 52. M.	— Tubercles and cavities in lungs, kidneys — probably diseased.	— Tubes mostly healthy.
24.	— 7. M.	— Scrofulous disease of joints, kidneys — diseased.	— Tubes tolerably healthy, numerous nuclear masses.
27.	— 49. M.	— Kidneys diseased, carbuncle.	— Tubes pretty healthy, some intertubular formation.
34.	— 16. F.	— General tuberculosis.	— Marked wasting of solitary gland, morbid mammillation of mid and pyloric regions, tubes generally healthy.
35.	— 55. M.	— Dropsy, dilatation of heart, diseased — kidneys.	— Tubes healthy.
36.	— 37. M.	— Bronchitis, emphysema, spinal curvature.	— Tubes healthy.
45.	— 63. M.	— Double pneumonia.	— Tubes but little wasted.
48.	— 24. M.	— Heart hypertrophied and dilated, lungs — congested.	— Tubes quite healthy.
57.	— 47. F.	— Vomicae in lungs, kidneys diseased.	— Tubes in mid region wasted.
58.	— 57. M.	— Abscesses in right lung.	— Tubes healthy.
62.	— 74. F.	— Cerebral hemorrhage, renal degeneration.	— Tubes healthy, ulcer in pyloric region.
66.	— 41. M.	— Tubercles and cavities in lungs.	— Tubes healthy, except in pyloric region.
67.	— 34. F.	— Œdema of lung.	— Tubes healthy, except in pyloric region, sarcinae.
71.	— 35. F.	— Masses of softening fibrine in lungs, — peritonitis.	— Tubes healthy, except in pyloric region.
72.	— 64. M.	— Chronic bronchitis.	— Tubes healthy, except in pyloric region.
74.	— 68. M.	— Rheumatism, œdema of lungs, aortic valves diseased.	— Tubes tolerably healthy.
75.	— 4mo. F.	— Muco-enterite.	— Tubes quite healthy.
77.	— 21. M.	— Cancer of peritoneum.	— Tubes generally healthy.
80.	— 56. M.	— Cerebral hemorrhage, kidneys granular, a drunkard.	— Tubes healthy, except in pyloric region, some hemorrhagic erosions.
93.	— 49. M.	— Purpura, hemorrhage, cirrhosis of liver, a drunkard.	— Tubes much wasted.
94.	— 52. F.	— Bronchitis, lungs condensed, granular — kidneys.	— Tubes tolerably healthy.
99.	— 77. F.	— Emphysema and œdema of lungs.	— Tubes tolerably healthy.
23 total.			

The general results of this table are as follows:—
Age seems to predispose to catarrh; of these 23 cases 11 were past 50 years, and 15 past 40 years of life. The two sexes are about equally liable, the proportion of 10 females to 15 males having to be corrected by an allowance for the greater number of males in the 100

examined. The mere existence of catarrh seems to have no marked effect in causing disorganization of the glandular structure: the tubes were found tolerably healthy or quite so in 21 out of the 23 cases. In 8 cases there was either positively disease of the kidneys, or reason to suspect strongly that they were not healthy. Tubercles existed in the lungs in a more or less advanced state in only 4. Including these there was found an irritated or inflamed state of the lung tissue in 15. Of 2 only is it stated that they were in the habit of drinking to excess. Dr. Huss's researches, however, tend strongly to show that the habit of spirit drinking very commonly produces an inflammatory condition of the gastric mucous membrane, and such morbid changes as Rokitansky describes to belong to catarrh. This would seem *à priori* highly probable, yet, on referring to notes which I have of 9 persons who were known to drink to excess, I do not find any mention of signs of catarrh discovered by post-mortem inspection in more than 2 or 3. The following case, which I give in detail, is a good illustration of catarrh of recent origin, and excited by the usual cause of pulmonary catarrh, with cardiac hypertrophy as a predisposing cause. Case 7.—J. M., æt. 24, admitted Dec. 17th, into St. George's Hospital. He stated that he had been ill only one week with catarrh and pain at the lower part of chest; face flushed, skin hot, pulse quick, breathing hurried; there were rather fine, moist sounds at the base of each lung. A little tartar-emetica was given, and afterwards Cal. gr. ij. et Opii gr. $\frac{1}{2}$ —sextis horis. The expectoration was abundant and frothy, not adhesive. Urine scanty and loaded, not albuminous. On 20th,

sputa were tinged with blood, rather bright-coloured. C. c. inter scap. ad 3 xij. Aphonia came on the same evening. The cough continued severe, the expectoration difficult, and the breathing oppressed. He became more and more depressed, and died on 24th. Post-mortem :—Body in good condition. Both lungs much congested, at back parts particularly, in which situation there were small spots of extravasation of blood. Heart very large, the cavities much dilated, the walls thickened, especially on the left side. Valves healthy. Liver, spleen, intestines, healthy. Kidneys, large, coarse, congested, but healthy. Stomach was of medium size, the rugæ were marked in the splenic and mid regions; these same parts were highly congested, and covered with tenacious mucus containing black matter. The pyloric region was less congested, and was also covered with similar mucus containing less black pigment. The reaction of the surface was in no part acid. The black matter consisted of dark yellow pigment, partly in the diffused state, partly forming granulous masses; it lay in a tenacious plasma, embedding multitudes of columnar particles separate and in groups, and also, as it seemed, numerous débris of epithelium from the tubes. Splenic region: Tubes generally very healthy, though a little altered by self-digestion, their interspaces remarkably distinct. Some nuclear masses (solitary glands) were observed at the bases of the tubes. Mid region: Tubes very healthy, but containing a good deal of opaque oily matter in their lower two-thirds; their epithelium was abundant, and the particles were well formed. Pyloric region: The tubes and the villi were very healthy. In this case, as in the great majority

of those contained in the foregoing table, there was no organic change to any considerable extent in the glandular structure of the stomach, so that it seems pretty well ascertained that after attacks of catarrh the organ may retain all its integrity and functional power. This quite accords with clinical experience. The result is very different in other diseased states which we shall presently examine. The congestion of the vessels which was set up at the time of the acute attack had not subsided, although it had partly relieved itself by hemorrhagic effusion on the surface, which was, doubtless, the origin of the dark pigment imbedded in the mucus.

Acute idiopathic gastritis is known to be very rare, and I have not met with an instance of it. However, in that most valuable storehouse of facts, Andral's *Clinique Médicale*, several cases are related, and I have performed one or two experiments on animals which have given me the opportunity of studying the morbid changes more minutely. Andral's first case may be quoted as a typical instance. "A woman, *æt.* 27, who had always enjoyed good health, suffered in the commencement of November, 1830, some domestic annoyances. From this time her digestion, which till then was good, became disturbed; she felt an acute pain in the epigastrium, and soon after everything she swallowed was rejected." After suffering in this way five days, she came under Andral's care. She had then severe thirst, vomited all the drinks she took, and in the last twenty-four hours had brought up several times nearly a pint of bilious matter. She had acute pain, limited to the epigastrium. The tongue was covered

with a white coat, beneath which appeared a great number of red papillæ, especially at the apex. The bowels had not acted for four days. Pulse above 112; respirations, 28; skin, hot and dry: leeches, ice, a blister, and some other remedies were employed, but with little advantage, and the patient died towards the 40th day. "Towards the 26th day the tongue lost" its white coat; "it became red and smooth over its entire surface." After the 34th day aphthæ appeared and spread all over the buccal mucous membrane. "The vomiting ceased three or four days before death." Post-mortem:—"Beneath the whitish layer which covered the tongue and cheeks, the mucous membrane of these parts was intensely red. The pharynx and œsophagus were in a healthy state. The stomach, which was strongly contracted, was nearly the size of the transverse colon. Its inner surface, over nearly its entire extent, was of a brownish red. This colour had its exclusive seat in the mucous membrane, which had become in every part very thick, and was at the same time very friable. On its free surface there was discovered a multitude of small red or blackish points, which seemed to have their principal seat in the villi; however, beneath these the body of the mucous membrane was red, and, as it were, penetrated with blood; in no part could this membrane be detached, it gave way under the forceps, and in several points it resembled a pulp without any consistence. Such was the state of the mucous membrane of nearly the entire stomach except near the pylorus, where it resumed its normal consistence, and where its colour was merely grayish. The remainder of the

digestive tube was pale; neither patches nor isolated follicles were discovered in it. The other organs presented nothing remarkable." The state of the gastric mucous membrane in this case reminds me very much of that of the intestinal mucous membrane in dysentery; and the structure of the lining of the large intestine is so similar to that of the stomach that it seems just to apply an observation made on one to the other. The inflamed mucous membrane of the colon is found in some cases thickened, friable, and red-stained throughout; and on microscopic examination it is seen that the basement membrane of the surface is gone, that an abundant granular exudation has taken place between the follicles and in the corium and submucous tissue, and that the whole tissue is saturated with exuded hæmatine. The follicles are more or less wasted and destroyed. Such, there can be little doubt, was the condition of the gastric mucous membrane in the case quoted from Andral. The two following experiments performed on animals whose stomach is almost exactly like the human, are sufficiently interesting and illustrative, in the absence of better materials, to make it worth while to give them in detail. (I.) A large adult black cat having been placed under the influence of chloroform, was poisoned with arsenic by having a wound made in the back of her neck, and the powder inserted. She survived at least till the evening, the operation having been performed at 11 A.M., but was found dead and stiff the next morning. She appeared while under the influence of the poison to be in much pain and was quite prostrated. On post-mortem examination the wound was found not at all inflamed, the arsenic

lay there as if it had produced no effect. The lungs were extensively inflamed, much congested in some spots, and consolidated a good deal in most parts. The heart was healthy. The stomach was much inflamed, as, indeed, the whole intestinal tract. The cavity of the former was empty, moderately contracted, the rugæ of the membrane developed, and its surface smeared with a copious dirty-grayish fluid, beneath which the mucous membrane was a good deal injected. The mid region was most reddened, the pyloric least, the splenic partially. The termination of the œsophagus was somewhat affected, the membrane was more injected and less pale than usual. The duodenum and the upper part of the small intestine were widely open, and contained much fluid similar to that in the stomach; it was distinctly alkaline; the lower part of the small intestine was strongly contracted, the mucous surface was of a rather bright red, and not covered with any fluid. The large intestine was of a decided red all over its mucous surface, and not smeared with any secretion. The liver was congested, the bile seemed normal, the spleen and the kidneys appeared healthy. The fluid mentioned as covering the surface of the stomach was distinctly alkaline, bluing reddened litmus; under the microscope it showed remains of columnar and tubular epithelium, much granular and some oily matter. The particles of the tubular epithelium were large; they exhibited faint nuclei, but were not granular as usual, rather remarkably homogeneous. A vertical section of the splenic region showed the surface covered by particles of tubular epithelium, many of them curiously elon-

gated. After washing, the basement membrane and the orifices of the follicles on the surface were observed to be tolerably natural. The tubes were much less distinct than usual, but faintly distinguishable; they were overlaid by abundant interstitial exudation of granular matter, as well as distended with epithelial growth. The corium, also, was infiltrated with granular exudation. In the mid region the capillaries near the surface were seen beautifully injected, the surface was covered with a thick layer of cells poured out from the tubes; these were granular, and contained numerous oil molecules; the tubes themselves were plainly seen, their outlines fairly distinct; they contained much granular and especially much oily matter, and there was some, but not much, interstitial exudation. After washing the surface the basement membrane was seen, but paler and less homogeneous than natural. This was the case also with the basement membrane in the splenic region. In both regions there were large nuclear masses (solitary glands probably enlarged). In the pyloric region the tubes lay close together; their outlines were distinct, their epithelium appeared tolerably normal, the surface was healthy, and was covered by a mucous layer. The condition of the intestine corresponded essentially to that of the stomach; it does not seem necessary to give a detailed account of it. In the duodenum, however, there was one circumstance worthy of notice, viz., that many of the villi, after washing off the tenacious and granular exudation which covered them, were seen to be remarkably ragged; they were, in fact, broken up, had lost their investing basement membrane, and

their nuclear corpuscles, and showed only some remains of the long vessels which run up into them with surrounding granular films. Some of the villi remained tolerably perfect; their interior was filled with granulous substance, and their surface covered with small glomeruloid corpuscles. This change is clearly of the same character as inflammatory softening in other parts. The morbid process in the stomach had evidently increased the production of epithelium in the tubes as well as promoted its detachment, but this epithelium was altered in some visible degree from its natural condition, and probably was more essentially changed in qualities which the microscope could take no cognizance of. I mean that it would not perform its part in the work of digestion like the healthy product. The alkaline reaction of the fluid on the surface showed the marked difference between the product of morbid irritation and the natural secretion. This alkaline condition probably proceeded from the exudation of serous fluid from the blood. It is rather remarkable, that there was more evidence of interstitial exudation between the tubes in the splenic region than in the others; the pyloric, certainly, was that least affected. In the next experiment this will be seen to be even more markedly the case. (II.) A middling-sized dog was poisoned with arsenic, by inserting it into a wound, which was immediately closed up. This was at 10 $\frac{1}{2}$ A.M. He soon after vomited and had clayey evacuations, later in the day he passed some bilious, and later still, some small bloody ones. He remained quiet all the day, was just breathing the next morning, and was dead at 11 A.M. The œsophagus was found

pale, and the epithelium in its usual state. Immediately on entering the stomach the mucous membrane in the splenic region was seen to be of a very dark red, almost black, colour; it appeared as if blood had been extravasated into its substance, which was rather swelled. This extreme congestion was limited to the splenic region, and ceased abruptly; the mid region was of a uniform pink or red tint, which faded gradually towards the pylorus, so that at that part the surface was quite pale. The stomach was quite empty, the rugæ were very marked, there was no mucus or any exudation covering the membrane, the reaction was neutral. There was a good deal of serous effusion in the submucous tissue. The duodenum was smeared with bilious fluid, and was injected in some small patches. The small intestine presented only a few patches of injection, the upper half was smeared with bilious fluid, and the muscular coat was relaxed; the lower was contracted, and contained a dark, blackish matter. The large intestine was inflamed, much like the stomach; there appeared to be extravasation of blood along several of the plicæ, at their margins. There was no peritonitis. The liver was much congested; the gall-bladder full of bile; the kidneys were healthy; the spleen was large and very dark, but showed, under the microscope, no sign of morbid change; the lungs were collapsed, but not inflamed; the heart was healthy. On closer examination of the stomach I observed that the summits and the adjacent parts of the rugæ were much more congested than the intervening furrows. This was rendered particularly manifest when the mucous membrane was dissected off, when it presented a

surface mottled by dark patches of extreme congestion, separated by comparatively pale intervals. In the mid region, also, it was very apparent that the chief locus of the hyperæmia was the convex margin of the rugæ. The surface in some of the congested patches in the splenic region was manifestly raised, in other similar ones it was sunk in along a rather narrow line, where there was a commencing slough. A vertical section of the mucous membrane carried through one of the raised patches showed the basement line of the surface, passing on continuously from the more healthy part to that where the extreme congestion and extravasation existed. The chief focus of the congestion was immediately beneath the basement membrane; the deeper part of the patch and the adjacent lateral parts were very much less affected. Where the congestion had not attained its highest point, the tubes appeared very tolerably natural, their homogeneous walls were distinct, scarcely surrounded by any exudation except by a small amount at their bases. The epithelium of the tubes consisted of large, well-formed cell particles, and similar free, soft, albuminous matter, mingled with very numerous oily molecules. In one spot of intense congestion it was seen that the basement membrane, just at the seat of extravasation, was destroyed, while it existed on the adjacent more healthy part. There was thus exposed a mass, consisting of granular matter and cells from the tubes, all saturated with orange pigment. In one of the spots where sloughing was taking place, there was seen a mass of extravasated blood at the deep part of the mucous membrane, the thickness of which over an exactly limited width was

much diminished, its tubes were very indistinct, and apparently breaking up into granular and oily débris. In the mid region the tubes were very distinct, the capillaries were a good deal congested, but nothing like those in the splenic region; there was no interstitial effusion, the epithelium was abundant, consisting of cell particles of oily and granulous aspect. On the surface, the basement membrane was not destroyed, but it seemed to be altered, less homogeneous, and of more fibrous and granular aspect, some columnar particles seen adhering to it were dim and smudgy. In the pyloric region the deep fossulæ and the tubes were found quite healthy, there were scarce any injected vessels to be seen; the columnar epithelium was more natural. There is some resemblance, in the results of inflammation observed in this case, to the morbid changes taking place in dysentery, where the margins of the rugæ are always found to be the parts most highly affected, both by the preliminary inflammation, and the subsequent ulceration and sloughing. It is very remarkable how the inflammation was, as it were, concentrated on the splenic region, and how the pyloric was comparatively free, this being the opposite to what occurs in the catarrhal state. The hyperæmia was much more intense in the dog than in the cat, while the exudation (interstitial) was less, a difference which must depend on some dissimilarity in the endowments of the tissues in the two animals. Some of the various forms which dysentery presents may depend on similar individual differences. Life was prolonged too short a time in these experiments to allow of ulterior inflammatory changes taking place, but it

is clear that the main effects were produced, viz., hyperæmia, exudation, sloughing, and alteration of the secretion. At a later date there is no doubt that the hyperæmia would have declined, and the interstitial exudation increased, while the glandular tubes would have become much wasted.

The following are the only two cases I have observed in which there appeared to be any degree of actual gastritis: Case 8.—J. J., æt. 30, labourer, died in St. George's Hospital with a very large cancerous growth in the abdomen. He stated that he had been ill all the last summer, had given up work in November. His tongue was dry, red, and furred at back; he took very little food for the last three weeks of his life. He had suffered some years from pain in the stomach, and impaired digestion, which had been worse the last eight months. The stomach was pushed forwards and the heart upwards. The urine was not albuminous. Post-mortem:—Abdomen much distended by fluid. Glands in the anterior mediastinum full of encephaloid disease. A firm, solid, lobulated tumour projected into the pericardium, encircling the inferior cava, and partially obliterating it, just where it enters the right auricle. There was a large post-peritoneal growth lying in front of the spine, as far down as the sacrum, completely encircling the aorta and vena cava, and extending laterally so as to surround the kidneys; it was an offset from this which had made its way into the pericardium. The inferior cava, from its entrance into the auricle down to the second lumbar vertebra, was entirely blocked up by firm laminated, fibrinous coagula. There were some small masses of cancerous disease on the front of the heart and at the root of the

pulmonary artery. Heart otherwise healthy, and spleen, kidneys, liver, pancreas. Lungs much congested, universal pleural adhesions on left. The mucous membrane of the stomach was remarkably injected, most so in the mid and pyloric regions. The injection was chiefly patchy and diffused, but in various places formed red rings, surrounding a white central spot, the size of a pin's head. The cavity was rather contracted, the reaction of the surface was alkaline, and it was covered with mucus in the situation of the great curvature where it bends up towards the pylorus. In the splenic and mid regions the tubes were healthy, and I found no nuclear (solitary gland) masses. In the pyloric region the tubes were very much obscured by interstitial fibroid formation, and were in some degree wasted; there were a few nuclear masses seen in the deeper part of the mucous membrane. In some parts there was marked aggregation of the lower parts of the tubes into bunches. The submucous tissue and the corium were thickened. Near the cardiac orifice, in the lesser curvature, there was a small elongated shallow ulcer, with its bottom quite black from pigmentary deposit. The annular spots of injection existed in great numbers in all parts of the stomach, and it was manifest that there was an erosion or ulceration, a true loss of substance, in the centre of each. Thus, in one of the spots there was a scattered nuclear deposit, and the tubes were quite absent, the surface being covered in by a thin membrane. In another the mucous membrane was cleft in one of these spots, just as in a case of mammillation, quite down to the corium. In another the mucous membrane was sunk in deeply, and the tubes

were in great part destroyed at the central part, while there was vascular injection on each side, and on one a large nuclear deposit occupying the substance of the mucous membrane. In this case inflammation seems to have specially affected the solitary glands, and caused ulceration to take place. It is doubtful how long it may have been in progress, probably not a very long time, as otherwise more extensive changes would have occurred. The irritation occasioned by the surrounding cancerous growth, acting upon a viscus which had previously been liable to functional disorder, was probably the exciting cause of the inflammation. Case 9.—J. C., æt. 24, carpenter, admitted into St. Mary's, November 4th. He has generally had good health, and all his family also. He began to have pain in the back and right side about four weeks ago, and soon after his abdomen began to swell. He has now much tenderness of the abdomen, and manifest effusion. Tongue whitish with red edges; appetite bad; urine reddish and turbid with lithates, not albuminous. There were no very marked gastric symptoms; he spoke once of his abdomen swelling after eating, and some days afterwards of food causing pain in the stomach, but the general abdominal distress, and general suffering and fever, were far more prominent, and under them he sank, December 29th. Post-mortem :—The body was finely made, emaciated, anæmic. There was some pleurisy on both sides, most on the right, with effusion of lymph and serum. Both lungs were tolerably healthy, there were a few miliary sub-pleural tubercles on the left, and œdema and congestion of the back of right. Heart, kidneys, liver, and spleen, healthy. There was an enormous quantity of scrofulous deposit

in the subperitoneal tissue in almost every part, causing all the viscera to be matted together into one inseparable mass. The mucous surface of the stomach was everywhere very dark in the splenic region, and became gradually less so towards the pylorus: it was covered over near the junction of the splenic and mid regions by yellowish tenacious mucus of distinctly alkaline reaction. Splenic region: Tubes were much obscured or destroyed by intervening nuclear and fibroid formation; there were numerous nuclear deposits at the bases of the tubes. Mid region: Tubes very much obscured, and in various degrees atrophied by interstitial nuclear and fibroid formation; in some parts of the mucous membrane and submucous tissue there were large groups of round black pigment globules, each about the size of a blood corpuscle. Pyloric region: Tubes extremely obscured, or rather, in great part obliterated, by fibroid formation. The tenacious mucus on the surface contained very numerous crystals affecting more or less the prismatic shape, which disappeared in muriatic acid. In this case, I believe, the masses of scrofulous deposit had acted as a cause of irritation on the stomach, and produced a subacute gastritis, which left traces of its existence in the black discoloration of the mucous membrane, and the interstitial exudation, and wasted condition of the tubes. In another case of tuberculous peritonitis which I have notes of, where there existed a much less amount of scrofulous deposit, and where the intestines were not matted together, but floating in liquid effusion, the tubes of the stomach were not at all wasted, except in some parts of the pyloric region; they contained, however,

a considerable quantity of black pigment in the form of fine molecules mingled with their epithelium. There was some alkaline mucus on the surface. This man, æt. 45, had been ill nearly six months, and stated that his digestion had been disordered during that period, his appetite had been deficient, he had felt pain at the epigastrium increased by taking food, and he had been thirsty. This is an illustration of what experience often shows to be the case, viz., that the symptoms of dyspepsia are commonly much more prominent in patients whose gastric mucous membrane retains its healthy structure, than in those in whom it is in great degree disorganized. As we shall hereafter see that age has a powerful predisposing influence in the production of organic change in the stomach, the conclusion that the interstitial deposit, and wasting of the tubes, in the *younger* person was the result of the gastritis induced by the irritation of the scrofulous masses is the more probable. Both stomachs were in some degree inflamed, as evidenced by the black discoloration, the wasting of the tubes and interstitial exudation (in one), and the presence of abnormal alkaline mucus on the surface; but the inflammation in the younger patient had involved the texture of the mucous membrane more seriously, and produced much more destructive effects.

(III.) *Hypertrophy and Atrophy of the Solitary Glands.*—From the account given of these structures in the chapter on the Anatomy of the Stomach, it will be very manifest that it is not possible to state with certainty what degree of enlargement is to be regarded as morbid. Neither can it be clearly laid

down what degree of diminution is to be considered as constituting a diseased state. The best proceeding will be, I believe, to give well-marked examples of both conditions, and leave the reader to judge, in any given case, how near it approximates to one or other. The following case was furnished me by my friend, Mr. Filliter. Case 10.—Ellen S., æt. 11, died after only a few hours' illness, with cerebral symptoms. There was no other morbid condition found on post-mortem examination than that the interior of the small intestines was studded with bodies like millet seeds, some as large as a small pea; Peyer's patches were also much enlarged. The stomach was red-stained internally in the splenic region; it presented in this part a multitude of whitish pin-head spots, several of which were perforated by a small hole. In the mid region the same were seen, but less apparent, and less numerous, and not showing any perforations. In the pyloric, the surface was covered with larger whitish prominent spots, which produced a kind of mammillation. The splenic region contained numerous large nuclear masses, some circumscribed, others more diffused, and encroaching on the tubes considerably. In the mid region there was much less trace of them. In the pyloric region the prominences were found to be occasioned by the extraordinary development of the solitary glands (or nuclear masses), which in some parts extended through almost the whole thickness of the mucous membrane. The tubes in the splenic and mid regions were healthy, and tolerably so in the pyloric. The mucous surface of the duodenum presented a great number of prominent spots like those in the pyloric region, except that many of

them had large and distinct orifices. These consisted also of massy nuclear deposits.

It seems as if, in this case, there had taken place an extraordinary development of the solitary glands in the stomach and intestinal canal, as well as of the agminate in the latter. Whether it was a primary morbid condition, or a secondary originated by the poison of fever, whose stormy outbreak proved fatal, can scarcely be decided. From that form of hypertrophy of the solitary glands in which the masses of nuclei are no longer circumscribed, but diffused for a certain distance among the tubes, there are gradual transitions to a state in which the whole thickness of the mucous membrane is occupied by similar nuclear matter, while the tubes have perished more or less completely. The nuclei are commonly imbedded in a stroma, which seems to be of fibroid quality though of nearly homogeneous aspect, and there are all kinds of intermediate conditions between that now described, where the nuclei, closely crowded together, are the sole apparent feature, and others to be hereafter noticed where the tubes are replaced by a granular or fibrous material. In the pyloric region, especially, it appears sometimes as if the nucleated substance which occupies the interior of the villi had increased very considerably, and extended downwards towards the corium, encroaching upon and obscuring or obliterating the tubes. When the tubes are much wasted, in consequence of this interstitial formation, there is but little epithelium seen exuding on the surface of a section. Case 11.—M.K., æt. 50, admitted September 14th, 1853, into St. George's Hospital. He stated that he had been attacked by jaundice five months before, and

had never been well since : he had had no previous illness. He was jaundiced and emaciated. Pulse 120. He had cough and dyspnœa. Urine rather scanty, not albuminous. The stools were at one time clayey, at another green and offensive. The abdomen became tense, tympanitic, and tender. He sank, and died by asthenia on 27th. Post-mortem :—There was considerable ascites, much effusion into the left pleura ; the right was obliterated. The skin was tinged yellow, there were some purpuric spots on the chest. The lungs were emphysematous. The heart was rather small, the valves thickened and atheromatous ; there was a white patch on the pericardium. There was extensively-diffused chronic thickening of the peritoneum, forming separate nodules on the under surface of the diaphragm, and upper of liver ; and a considerable collection of soft yellow exudation under the peritoneum in the recto-vesical fossa. The bladder was healthy. The kidneys were small, their surface smooth, their tubes not very healthy, some of them containing extravasated blood. The liver was of a dark red, with patches of a greenish colour here and there ; the ducts were much dilated. In all the green patches the cells were destroyed. It appeared that the orifice of the duct. com. choled. was a good deal obstructed, if not completely, by a mass of induration in its vicinity. The reaction of the mucous surface of the stomach was not acid ; the membrane appeared generally healthy, but was marbled near the pylorus. Splenic region : The basement line of the surface was intact, there was but little epithelium exuding, no tubes were discernible, the whole depth of the mucous membrane was occupied by a fibroid tissue loaded with

nuclei. The mucous membrane, though so altered, was not wasted; it was of its usual thickness. In the mid region the tubes were rather more distinguishable, but were overwhelmed amid a mass of nuclear particles, granulous and fibroid matter, which extended even into the corium. At the deep part of the mucous membrane, where the lower ends of the tubes would be, there were nuclear masses. In some parts the basement line of the surface was lost, in others it remained distinct. In the pyloric region, the tubes were indiscernible, there was no epithelium exuding, but the whole mucous membrane was pervaded by a deposit of nuclei and fibroid material. Some crystalloid masses of prismatic shape were seen in several parts. The fat cells in the submucous tissue were much wasted, and appeared only as yellow globules about the size of a pus corpuscle. It was very remarkable how completely free the submucous tissue was from any indurating deposit, the mucous coat played freely over the muscular. The nodules on the peritoneum consisted of masses of nuclei and granular matter. The existence of such extensive disease of the stomach as was here discovered, without any symptoms to attract attention having presented themselves during life, and with so little appearance to the naked eye of morbid change after death, is surely very remarkable. The power of the organ as a digesting apparatus must have been lost well-nigh completely, and yet the clinical record makes no special mention of dyspeptic symptoms. This is a discouraging fact for the physician, for how shall he seek to counteract a morbid change which is completely latent? One or two more instances of the same kind may be quoted before

attempting to consider the nature of the pathological process. Case 12.—E. L., æt. 24, admitted into St. Mary's Hospital, December 30th. He stated that he was quite well till ten months ago, when cough came on, and he became emaciated. He had dropsy, and his urine was found to be albuminous, and there were manifest signs of tuberculous disease in the lungs. He sank, and died January 21st. For about the last fortnight of his life he could scarcely take any food. Post-mortem :—The lungs contained tubercles and vomicæ. The kidneys were enlarged and mottled, their epithelium degenerating fattily, and the capillaries of the Malpig. tufts contained matter of the same appearance as that termed bacony. The rugæ of the stomach were strongly developed; its aspect was quite pale and tolerably healthy. In the splenic region the tubes were atrophied to a very great degree, the tissue was infiltrated with nuclear deposit, and presented nuclear masses here and there; there was much granular matter mingled with the nuclear. In the mid region the tubes were atrophied in some parts to a very great degree, with intervening nuclear deposit in abundance. In the pyloric region the tubes were very much atrophied with considerable granular and nuclear interstitial deposit. After careful study of this specimen, I came to the conclusion, that not only was there interstitial nuclear formation *between* the tubes, but that their epithelial contents also became converted into granular substance loaded with nuclei, while the homogeneous wall of the tubes atrophied, and at length the intra-tubular mass came to blend with the extra-tubular into one uniform congeries of granular matter and nuclei. Case 13.—Ann J., æt.

70, had been confined to bed for four or five years, had suffered long from chronic rheumatism, and had had attacks of mental aberration, being occasionally violent. She had no dyspeptic symptoms. Died of bronchitis. Post-mortem:—Brain wet, subarachnoid fluid increased, veins injected, brain healthy, gray and white matter of natural aspect, slight thickening of arachnoid of convex surfaces, scarce any gland. Pachioni. Lungs rather emphysematous, much congested and condensed at back part. Heart healthy, a white pericardial patch. Liver fatty. Kidneys wasted and granular. Spleen small. Body pale and thin. Stomach very much contracted, contained some chocolate-coloured, feebly-acid fluid. This consisted of a slightly mucous plasma, containing multitudes of columnar epithelial particles, and some from the tubes, together with oily remnants of food. Splenic region: The mucous membrane is extensively infiltrated by nuclear particles and granulous matter, and there are some large more circumscribed masses of the former. The tubes have extensively perished; here and there large groups of opaque convolutions are seen, but in several parts there is no trace of them. Mid region: Tubes more or less wasted and destroyed amid an overwhelming infiltration of nuclei, which form large masses in the subtubular tissue and corium. Pyloric region: Villi extremely well seen, filled with nuclear particles: these pervade also the whole of the mucous membrane; the tubes are extremely obscured, and often much atrophied; many of them are fatty in their lower parts. In some sections there are large subtubular and intertubular nuclear deposits. Duodenum, its villi and Brunnerian glands healthy. The prominent

features of this case are the chronic rheumatism, senile decay, emaciation, and cerebral disorder, observed during life; and the post-mortem revelations of a wasted brain, lungs, liver, and especially kidneys and gastric mucous membrane. Here is no indication of inflammatory action, but many indications of failing and perverted nutrition. Case 14.—E. G., female, æt. 52, admitted into St. Mary's Hospital, Jan. 21st, after having been severely burnt. She had been subject eight years to epileptic fits, occurring at intervals varying from fourteen to one or two days. In one of these she set herself on fire. For some time after her admission she took food well, and went on pretty favourably; but afterwards she sank, could not take food, only wine, and was very thirsty. She died February 17th. She always had good digestion, could eat any kind of meat, never complained of pain in her stomach; was very strong and full-breasted. Post-mortem:—Lungs and heart healthy. Much greenish coffee-ground matter in mouth, œsophagus, trachea, bronchi, and stomach. There were several ecchymosed spots on the surface of the stomach. In the cœcum there was a large patch of deep red congestion, and red patches also at the lower part of the ileum. Brain appeared healthy, much serum on its surface. Kidneys and liver healthy. The internal surface of the stomach was pale, but covered with black mucus from exuded blood. In the splenic region the tubes were tolerably healthy. When the membrane was held up to the light it was seen to be divided into separate masses by translucent furrows. The mid region was of more uniform thickness, the tubes were utterly atrophied, and replaced

by a fibro-homogeneous stroma densely filled with nuclei and granular matter; in some parts the nuclei were more numerous than in others. The basement membrane of the surface was perfect. In the pyloric region the tubes were extremely atrophied, lost amid fibroid formation; the basement membrane was perfect in some parts. In one section a cyst was seen with its convexity towards the free surface. The hemorrhagic exudation on the surface of the stomach was no doubt the consequence of the injury inflicted on the skin, which cannot be supposed to have had anything to do with the production of the intertubular formation. It seems certain that the latter must have grown up in a very gradual, latent manner, causing no noticeable disturbance of any function, and not impairing particularly the digestive power, as a good part of the glandular structure (in the splenic region) still remained, and, perhaps, compensated for the decay of the other part by increased action. I have gone carefully through the 100 cases of which I have notes, and have tabulated those in which change of the kind we are now considering was decidedly present. The results are as follows, for it does not seem worth while to give the table *in extenso*. There were 41 cases altogether in which nuclear or nucleated fibroid deposit was found more or less extensively in the stomach. Of these 30 were males, and 11 females, a great excess on the side of the former, but lessened by the consideration that of the whole 100 cases 66 were males. As to *age*, 14 cases were under 30 years, 26 under 50, the rest above. As to *extent* and the *region* affected, in 14 cases all the regions were involved, and in 4 of these the

amount of new formation was very great. In 12 the pyloric region alone was affected, in 3 the mid region, in 3 the splenic, in 4 the splenic and pyloric, in 3 the mid and pyloric, in 2 the splenic and mid. As to *coexisting morbid conditions*, there were none which appeared to have any certain relation to the gastric change under consideration, but in 11 cases there was either unquestionable renal disease, or fair grounds for suspecting it; and in 11 also there was scrofulous or tuberculous disease. Fever was the cause of death in two cases, and perhaps in a third. The chief circumstances which I have been able to ascertain relative to hypertrophic increase of the solitary glands, or nuclear masses, may be thus recapitulated. (1.) It is of the nature of an interstitial growth, spreading among the proper elements of the tissue, and inducing their atrophy. (2.) It is generally combined with more or less of fibroid stroma, which in allied instances comes to predominate. (3.) Its formation is gradual and latent, announced by no symptoms, at least none that have been yet detected. (4.) Though by no means peculiar to advanced age, this certainly seems to favour its development; out of 5 cases in which the change was both general and extreme, two were 70, one was 64, one 50, and one 24. It is remarkable that in this last case the constitutional power was utterly prostrated by two terrible maladies, tubercular phthisis, and Bright's disease. It may almost be said that decay of nature had set in prematurely. (5.) Though it does not associate itself especially with any other morbid change, yet it is impossible not to recognize its resemblance to certain other changes of common

occurrence, in one or more particulars. These changes I have described at length in the "British and Foreign Medical Review" for April, July, and October, 1854, and have applied to them the generic name fibroid. They consist, most essentially, in interstitial fibroid formation, with wasting of the natural tissue. They occur in an unperceived, latent manner, and are first made known by secondary results. Cirrhosis of the liver, stenosis of the cardiac orifices, Corrigan's pulmonary cirrhosis, are typical instances of this kind, and Bright's disease is, in my opinion, of the same family. (6.) The relation which this change in the stomach has to inflammation is not at all easy to define satisfactorily; I think I can be almost certain, however, that there is no necessary connexion between the two, and I doubt very much whether inflammation be anything more than an occasionally favouring "moment."* Between cirrhosis of the liver and nucleated fibroid formation in the stomach there exists, in my belief, a very close analogy. In both the new growth is interstitial, in both it takes place latently, in both its structural characters are often almost identical, and in both there is no sufficient evidence that inflammation is any necessary part of the process. As a fibrous or sarcomatous tumour springs up in a certain locality, we know not how or why, so, I believe, do these low organized growths develop themselves under invisible influences, of which one probably is the failing assimilative power of the normal tissue. That plasma which a strongly living, vigorous tissue would compel

* I borrow the term from Rokitsky, as a convenient one to express an influential condition.

to maintain its own growth, and to enter into its own substance, passes in the interstices of the feeble organ into low, primary, elementary forms, which themselves usurp the vitality of the proper tissue, and grow and spread while it decays. That no special symptoms of indigestion should be observed is not surprising, when we reflect how gradual and quiet the invasion of the abnormal growth must be, so that the organ becomes, as it were, habituated to its altered state. Less and less of stomach digestion of the proteine aliments can be effected, but it may well be conceived that a compensatory exertion is made by the intestines, so that the loss of functional power is not so much felt. As the secreting tubes become obliterated there is the less possibility of any irritating unhealthy acid products being poured out by the mucous membrane, while, at the same time, as it loses its higher and more perfect organization, there can be no doubt that it becomes less sensitive to irritants than it would be in its healthy state. The mucous fluid on the surface of much-wasted stomachs is often alkaline or neutral, while that in healthier ones is commonly acid, often highly so. Any one who has noticed the powerfully acrid character of fluids regurgitated into the mouth, at times when digestion is somewhat disturbed in a healthy person, will not wonder that the morbid secretions of a sound stomach should be capable of causing much pain, which of course will not be produced by a mere mucous or feebly acid fluid. I am quite aware that a *healthy* acid secretion is appropriate to the stomach just as it is to the bladder, but it is not the less certain that unhealthy, or perhaps mis-

placed acid may be very irritating, certainly more so than a bland, mucous fluid. A very little clinical experience must convince any one of this. Simple enlargement of the gastric solitary glands has been seen and mentioned by Andral, but he was unacquainted with the true nature of these bodies, and supposed the prominent spots to be formed by distension of a follicle. He says that it is rare to find them in the stomach, but quotes from M. Billard the case of a child ten months old, in which the mucous surface of the stomach was dotted over, in all its extent, with a prodigious number of white granulations of the size of a millet seed. Similar ones existed in all the intestine. There can be little doubt that these granulations were enlarged solitary gland masses.*

* The following interesting case has come under my notice while these sheets are passing through the press:—A robust, temperate man, æt. 49, died quite suddenly about a quarter of an hour after a light supper. He had been under medical treatment for some weeks, on account of some symptoms indicative of indigestion. These were chiefly eructation of frothy mucus and flatus generally in the morning, occasionally amounting to vomiting. The organs were found all very tolerably healthy, with the exception of the kidneys, which were granular, but not wasted materially. The stomach was much injected throughout, and contained much acid chyme and débris of food. The mucous membrane, all over its surface, presented numerous depressed spots, about the size of a split pea, resembling very much superficial ulcers; these were of oval, linear, or irregular shape, with rounded, not thickened edges, and smooth grayish bases; there was scarcely more vascular injection around them than in other parts. In the splenic and mid regions the tubes were healthy: in the pyloric they were a good deal obscured by diffused nuclear formation, and there were large nuclear masses in the substance of the mucous membrane. In the depressed (ulcerated) spots the tubes were more or less completely wasted, and the tissue was pervaded by diffused nuclear formation, with a circumscribed deposit here and there. The pancreas was in an advanced stage of fatty degeneration. In this case, the undue enlargement of the solitary glands caused, beyond doubt, wasting of the normal tubular structure in their vicinity. In this way depressions were formed, which may more properly be termed local atrophies than ulcerations. Had life been prolonged, the

Atrophy of the Solitary Glands.—This change in a marked degree is not frequent, according to my observation. When, however, it does occur, it gives rise to appearances that can scarcely be correctly understood without microscopic examination. It may affect the solitary glands either after they have become hypertrophied, or in their natural condition. The two following cases illustrate, each, one of these occurrences. Case 15.—L. F., æt. 16, female, admitted into St. George's, Oct. 19th. Says she was well and strong three months ago. Has lost much flesh, had no pain until recently, only felt weak and out of health. Has now much pain in abdomen, especially below diaphragm on left side, it is hard, tense, and tender; bowels relaxed; has night sweats and dry cough; appetite bad; sleeps badly; signs of tuberculous deposit were observed under the clavicles; she sank gradually and died Nov. 28th. Post-mortem:—Body emaciated, extremities anasarcaous; lungs contained large numbers of scrofulous miliary deposits, especially in their upper parts; bronchial glands tuberculous; heart healthy; peritoneum thickened, and studded almost universally with small masses of yellow scrofulous deposit, which existed also in omentum and mesenteric glands; intestines injected, and adherent to each other in parts by means of scrofulous deposit; mucous lining of lower part of ileum ulcerated; kidneys and spleen contained

wasting process would probably have gone on, the nuclear formation spreading more and more widely, until at last the whole, or the greater part, of the mucous membrane would have been invaded by it. I do not think that the symptoms observed during life had much to do with this morbid change. The hyperæmia of the surface was more than can be ascribed to the stimulus of food, and indicated, I conceive, a degree of gastric catarrh; hence, no doubt, the eructation of frothy mucus, the flatulence, and vomiting.

some small tubercles ; liver pale, rather large ; stomach, surface covered over with yellowish-green mucus of acid reaction, slightly pinkish from vascular injection ; the mid region and the adjacent part of the pyloric were markedly mammillated ; the splenic region presented a great number of minute opalescent spots, having much the aspect of vesicles containing a fluid, and yet manifestly depressed below the surface. When the specimen was held up to the light, the spots were seen to be much more translucent than the surrounding parts. The tubes in this part were healthy in themselves, but there were large nuclear deposits here and there ; some of these extended through the whole thickness of the mucous membrane, and in the situation of the spots were excavated into a largish cavity, filled with a clear fluid, in which nuclei were floating. One of the spots examined from above showed a clear cavity, closed in by a thin fibrous membrane at the surface, and surrounded with tolerably healthy tubes. In one section of the mucous membrane in this part, the row of tubes was interrupted by a considerable cup-like depression, in which the tubes were not more than half the length of those on either side ; they did not reach up to the level of the free surface, nor down to that of the blind ends of those adjacent ; they were wasted at both ends ; there was a very considerable nuclear deposit lining the cup-shaped cavity above, and a smaller one also below, at the shortened part of the blind ends ; the basement membrane was not well seen on the adjacent surface on either side, and it was quite lost in the cup-shaped cavity. Mid region : the tubes were generally very healthy, but here and there were nuclear deposits,

often of considerable size, and extending more or less into the membrane; one lay quite at the surface, beneath the basement line, and had given origin to a cyst filled with a clear fluid, and lined by nuclear particles. In the pyloric region the tubes were much obscured by fibroid formation, their lower ends were opaque from fatty contents. Regarding the mammillated condition, I shall give some details subsequently. In this case there had been hypertrophic increase of the solitary glands, not only by enlargement of old ones, but, as it seemed, by the formation of new. In many of them the nuclear substance had liquefied, and given rise to a kind of cystoid cavity, which, by the rupture of the thin membrane covering it in above, would have been converted into an ulcer. The positive observation of nuclear masses lying at the surface, and not in the deeper part of the mucous membrane, makes it almost certain that they were new formations, not normally existing solitary glands.

Case 16.—A. B., female, æt. 9 years, died apparently of suppressed measles, as five other children of the same family were attacked by measles about the same time, and one more died with the same symptoms. These were, severe purging, prostration, headache, pyrexia. The brain was intensely congested, and the intestines in a less degree; the solitary glands of the ileum and the Peyerian patches were much enlarged; Brunner's glands were unusually apparent; the surface of the stomach presented throughout, except for about two inches near the pylorus, wasted solitary glands, giving the appearance, when the stomach was held up to the light, of translucent spots, and by direct light, looking like depressions of a whitish

colour; in the two inches adjoining the pylorus there were numerous opaque whitish spots, or short streaks, evidently unwasted, or rather enlarged solitary glands; the microscope showed in the translucent spots an absolute loss of substance, there were neither nuclear masses nor tubes in those spots, but all around they were tolerably healthy; just at the margin of the translucent spots there were seen some remnants of the nuclear mass in the form of granulous matter, mingled with a few corpuscles; the surface of the spot seemed to be covered in by a thin fibrous expansion; the white opaque spots in the pyloric region were large nuclear masses, remaining unwasted. I do not suppose that in this case the wasted condition of the solitary glands was at all dependent on the exanthematous disorder, no doubt it had been in progress long before the latter appeared; I have seen similar, though less considerable, change in some other cases, but it does not seem to belong to any particular pathological state, neither has it any recognizable symptoms, and it is not to be regarded as of any great importance; this, however, may be said, that it is a simple local atrophy, and no evidence of any inflammatory process having existed. Andral mentions that he has observed spots of circumscribed softening in the stomach, but it is not clear to me that they had the same origin as those above described; they were of larger size, and occupied by a pulpy matter.

(IV.) *Atrophy of the Glandular Tubes, with varying amount of Fibroid Formation.*—There is a group of instances of atrophic change, not well defined, but which yet it seems fit to separate from the foregoing, in which great destruction of the tubes of the mucous

membrane occurs. They are, for the most part, replaced by a fibroid or granular matter, much less loaded with nuclei than the new-formed tissue in the class lately described. Some of the following examples are very striking. Case 17.—T. P., male, æt. 62, very anæmic; has generally lived quietly, worked hard, and been a good deal exposed to weather. Was never laid up before this attack, and does not remember having had any previous illness. Six months ago had an accident, not injuring him materially. A fortnight after this, dropsy appeared in the legs. Has had cough, and watery, mucous expectoration some time. Pulse regular, of moderate force. A pulsating tumour is felt above the sternum, towards the right. The heart's apex beats in its normal situation, regularly and with good force. There is a loud, systolic murmur at the apex. The second sound can be heard at the base pretty clear, but attended with some murmurish sound. Higher up, in the course of the aorta, especially near the right clavicle, there is a very loud diastolic murmur, and a systolic also. On each side of the neck the systolic can be heard, but loudest on the left. A diastolic murmur is heard in the upper part of the abdominal aorta. The impulse of the heart is extended; it is felt manifestly over the lower part of the sternum, and in the epigastrium; its dulness extends just beyond the right edge of the sternum. The rhythm is occasionally intermittent. Breath-sound in lungs normal. Liver not displaced. No arcus senilis. The appetite was not very good, and there was occasional diarrhoea, or a tendency to it. He remained in the hospital (St. Mary's) several weeks, and improved somewhat, the anæmia, however,

scarcely diminishing, and then went out. Very soon after he caught cold, as he said, and was confined to his bed some time. He returned to the hospital September 20th, much weaker than he had been before, gradually declined, and died October 7th. Post-mortem:—There was extreme anæmia. The heart was large, its walls hypertrophied, its tissue of good colour. The aortic and mitral valves were efficient, but rather thickened. The right valves quite healthy. Ascending aorta healthy, but somewhat dilated; some rough calcareous deposits at the entrance of left subclavian. Left carotid came off from A. Innom., which was placed more to the left than usual. Atheroma of aorta not very advanced, but general; some bony plates in one or two parts. Other organs healthy. Stomach: the mucous membrane was generally pale, but tinged yellow by bile, with a few vascular arborizations here and there. Two portions of the mucous membrane were carefully examined, and found to be most gravely altered. In vertical sections no trace of the tubes was to be seen. The basement membrane still existed in some parts, in others it was lost; beneath it was a layer of fibroid tissue, containing at its lower part numerous fat vesicles. After the addition of acetic acid, some remnants of the tubes were brought into view, imbedded in an indistinctly nucleated fibroid stuff. One of these appeared as an imperfect tube, slightly bulged at its lower part, another as an oval cyst, with a short, truncated neck; another as a spherical cyst, containing some granulous matter, and oil molecules. The tube and oval cyst contained only an indistinct granulous, or granulo-fibrous matter. Here was a case of extreme wasting of the secret-

ing structure of the stomach, coinciding with like wasting of the blood, without any apparent cause, and without any symptoms that could excite suspicion of the extent of the lesion. Whether the tubes primarily underwent atrophy, or secondarily, in consequence of the encroachment of interstitial fibroid tissue, seems scarce possible to decide positively. I strongly incline, however, to the former view. The stethoscopic phenomena were very interesting. However it may be accounted for, there can be no doubt that a diastolic murmur was heard both by myself and Dr. Markham, although the aortic valves certainly appeared quite adequate to close the orifice. Possibly the dilated condition of the ascending aorta may have had some share in its production. Though the period of life was advanced, this was clearly but a very secondary "moment" in the atrophic change. In the following case it is probable that it was more influential. Case 18.—S. E., æt. 90, a nurse in an infirmary, died apparently of old age, having had no other disease, at least recently, except some slight bronchitis. Post-mortem :—Much fat under skin of abdomen, and about the viscera. Limbs spare. Heart healthy. Lungs very tolerably healthy, but œdematous, and engorged posteriorly. In the anterior margin of the right there was a mass of grayish induration, over which the pleura was thickened and adherent. Numerous pleural adhesions on both sides. Liver healthy, with some chronic thickening of the capsule. Kidneys atrophied to one-half of their normal size, or less, and highly granular. Uterus enlarged, retroverted ; its cavity much larger than natural, and lined with a bloody coagulum. Stomach contracted, except in the splenic

region. It contained some thin chocolate-coloured fluid, feebly acid. This exhibited, under the microscope, tubular and columnar epithelium, granular matter, and stellar groups of acicular crystals (margaric acid). The mucous membrane was throughout of rather dirty, slaty aspect. Splenic region: mucous membrane appears thinned; a section shows the tubes excessively wasted, débris remaining here and there, with fatty contents, and cystic formations also of large size, and the whole imbedded in a dense woof of fibroid tissue, which is traversed by a great number of remarkable yellowish-red streaks. These consist of coloured oil molecules, forming elongated fusiform bodies. The basement membrane remains perfect, but underneath it there is an abundant deposit of oily drops, or fat cells. Mid region: the tubes are quite changed from their healthy state; groups of convolutions are seen here and there, appearing as if they had lost their external openings. The basement membrane is very perfect, but all beneath it there is a coarse granular and fibroid tissue, containing celloid corpuscles, and abundance of free oil. Pyloric region, exhibited some marked mammillation. The tubes were wasted, and their lower ends thrown into convolutions in several parts, while their upper appeared to be obliterated. There was much granular and nuclear deposit under the basement membrane, which was perfect. There were a few massy nuclear deposits. Atrophic change, in this instance, had specially located itself in the stomach and kidneys. There seems every reason to believe that it had been very slow and gradual. It seems to have come on as a part of senile decay, and never to have manifested itself by any remarkable

symptoms. To speak of the changes wrought as the results of chronic gastritis or nephritis, of any degree or kind, seems to me to set up a pure hypothesis; scarcely more warranted than it would be to consider the wasting that affects the thymus, and the suprarenal capsules, as the result of chronic inflammation. Thoroughly do I agree with that great observer of disease, M. Andral, so wide-seeing in his views, and so calm and wise in his opinions, when he speaks as follows with respect to softening of the stomach:—
“Certainly it is proceeding on a fair and rational analogy, and not transgressing the laws of a sound philosophy, to admit that, in cases where the principal agents of life—the blood and nervous system—no longer nourish and excite the organs sufficiently, all the vital force of aggregation, by which the different molecules of the living tissues are held together, ceases to possess its natural and physiological intensity; thence the diminished cohesion of these tissues, and their greater or less softening, from the degree where, as is commonly said, *there is flaccidity of the flesh*, to that where the solid, losing the characters of organization, manifests a tendency to return to the liquid state. Thus the transparent cornea becomes softened, and is perforated in animals that are put on a regimen not sufficiently nutritive.”

What is true of one form of atrophy, is true, no doubt, of others. That inflammation may, and often does, produce atrophic changes, is perfectly true, but I cannot but regard it as a mischievous error, to assume that it is the only, or the most frequent, cause of such changes. Surely, to the unprejudiced observer, the great and wonder-moving circumstance is, that the

various tissues retain their endowments, and the organs discharge their functions, amid all the counteracting influences that surround them. Blink the fact as we will, vitality is the supreme overmastering power in the economy, and the most formidable maladies the physician has to oppose are just those which essentially depend upon its decay. Let the constitutional power be sound and unbroken, and we know we can deal with inflammation in most cases successfully; but when the reverse is the case, how much more difficult and discouraging does our task become! There is much more general appreciation of the true character of disease now than in former days, and yet how large is the space, and how prominent the position assigned to inflammation, and the antiphlogistic treatment, in our best class-books, compared with that which is given to other less manifest morbid processes. Inflammation is a term of universal authority; degeneration and atrophy have scarce a place in our vocabulary.

In the following case there was more evidence of the formation of new tissue than in the two preceding. Case 19.—C. H., æt. 63, admitted into St. George's, Nov. 8th. He was of rather full habit, his face, neck, and ears were of a purple colour, from congestion. He had general dropsy, which, with cough, had existed one month. Heart's action was irregular, its dulness extended, there was no distinct bruit, but the first sound was imperfect; and the pulse was remarkably feeble and irregular, giving the idea of mitral insufficiency. The expectoration was rusty, and rather adhesive. There was prolonged sonorous expiration over the front of chest, with some dulness and want of breathing at left base. Urine scanty, loaded with lithates, and

slightly albuminous. After some relief his breathing again became worse, and he died on Nov. 23rd. Post-mortem :—General anasarca. Universal pleural adhesions on right, a large amount of serous effusion in left cavity. Lungs healthy, except that the left was a good deal compressed behind. A small white pericardial patch. Heart's cavities all dilated, left ventricle much hypertrophied. Right valves healthy ; a considerable mass of calcareous matter was found between the layers of the mitral. Much fluid in peritoneum. Intestines healthy. Liver small, and its capsule contracted in many parts. Spleen small, firm, and compact, and its capsule opaque. Kidneys congested, their texture firm, capsules adherent, surfaces granular and cysted. Stomach ; reaction of contents strongly acid ; no vascular congestion in any part. Splenic region : the mucous membrane looks like a thin darkish layer contrasting with the white submucous ; the tubes are considerably disintegrated, and appear as irregular short columns of stunted small opaque cell particles. There is a prodigious amount of fibroid formation taking place in the subtubular tissue and the corium, which are all full of elongated and fibre-developing nuclei. Mid region : mucous membrane in one part of same thin dark aspect, tubes utterly broken up, and their remains, in the form of opaque cell masses, are scattered about and mingled with melanic granules. A great amount of fibroid formation with nuclei round and elongated is taking place in the subtubular tissue and corium. In another part of the same region, where the mucous membrane was of a lighter tint, the same changes were in progress, though not quite so far advanced. Pyloric region : the tubes are involved in a

good deal of fibroid thickening, which, however, does not affect the subtubular tissue and corium. They are tolerably healthy, but show some tendency to have their lower parts gathered up into bunches, and filled with fatty epithelium. The muscular coat is greatly thickened, so as to be about a quarter of an inch thick ; this is most marked about two inches from the pylorus. The mucous membrane everywhere moves freely over the muscular coat, showing that the submucous tissue is not indurated, or otherwise materially altered. This case I regard as essentially of the same nature as the preceding. Atrophic change was in progress in several parts, in the liver, spleen, kidneys, and stomach. A tendency to fibroid degeneration was evinced by the white pericardial patch, the cirrhotic state of the liver, and the fibre-formation in the corium of the gastric mucous membrane. These various morbid changes I believe to be coincident results of depraved nutrition, rather than so many sequelæ of inflammation attacking each separate part.

An increased amount of fibroid tissue in the pyloric region has appeared to me to be a very frequent change, though it may not be safe to pronounce too positively respecting the minor degrees of it, as the tubes in this region are interwoven with more fibrous tissue normally than those in the other regions. Fibroid hypertrophy, and now I speak as well of nucleated fibroid tissue as of simple, appears to me to be the cause of a change in the condition of the pyloric tubes which has been already mentioned. This consists in the continuity of the row as seen in a vertical section being interrupted, and gaps being formed occupied by fibroid tissue, while in the intervals there are groups of convolutions,

usually opaque from a fatty state of their epithelium, looking much like the terminal vesicles of a small salivary gland, but without any apparent outlet. Lesser degrees of this change are very common, but I have not met with any so extreme as the first which I observed, and which I have recorded in the Report of the Patholog. Soc. for '52-'53, p. 125. In this case the whole of the tubes in the pyloric region had lost their upper outlets, while the lower parts were thrown together, constituting small whitish masses embraced by fibroid tissue. Above these masses the mucous surface, now no longer involuted, passed on uninterrupted. I have seen a somewhat similar condition of the tubes in the other regions, and alluded to it in Case 18. Obliteration of the tubes at one part seems also to be the most frequent cause of cyst formation, though I feel almost certain that they originate likewise as simple vesicles, which afterwards enlarge. Sometimes they have a lining of small vesicular epithelial particles, while the cavity is filled with clear fluid; sometimes they are full of granular cells. They may form at any level in the mucous membrane, either at the bases of the tubes, or in the middle of their course, or close to the free surface.

V. *Mammillation*. — This change is generally considered as the result of hypertrophy, limited and partial, of the mucous membrane. Andral says (*Précis d'Anat. Path.* p. 48), "It is not rare to find the mucous membrane of the stomach hypertrophied in all its extent. Sometimes, as it thickens, this membrane preserves a smooth and uniform aspect; sometimes unequally hypertrophied, it presents a multitude of elevations, separated by sinuous depressions; it seems then, as it were, mamellonnée. Rokitansky, taking the same view,

distinguishes three degrees of hypertrophy:—In the first, there is simply general increase of thickness, and hardness of the mucous tissue; in the second, besides being thickened, it presents an uneven, racemose, or warty surface; it is mammillated: in the third, and most advanced degree, “it forms prolongations in the shape of permanent, firm folds, or of polypus.” Nothing is said by this eminent authority as to whether the hypertrophy be a merely apparent, unreal one, depending not on the increase of the natural structure, but on addition of new abnormal substance, or the reverse. Neither does he notice the opinion expressed by Kölliker and others, that the mammillated condition may exist in stomachs that are perfectly healthy. My own observations lead me to take a very different view of this state to that which has been generally adopted. It may be stated at once, that contraction of the muscular coat has nothing whatever to do with the production of mammillation. It throws the mucous membrane into folds, but does nothing more. I am also satisfied that the mammillated aspect may be easily produced in stomachs whose mucous membrane is almost or quite healthy. The following case was examined with a special regard to this point. Case 20.—J. P., æt. 32, waiter, admitted into St. Mary’s, May 5th. He stated that he had always been subject to cough. He had symptoms of phthisis, of which he died, May 28th. His appetite is reported as good ten days before his death. There were tubercles and cavities in both lungs. The heart was very flaccid, and its tissue pale. The liver was extremely fatty, and very much enlarged; it extended across the abdomen to the sixth left rib. Kidneys healthy. The

right lower extremity was anasarcaous, from coagulation of the blood in the femoral vein during life. The inner surface of the stomach was pale. The mucous membrane showed in several parts a good deal of puckering, so as to appear mammillated in some degree. These mammillations disappeared very much when the membrane was stretched, but it was then seen that the mucous membrane was not quite of uniform thickness, being evidently thicker in some spots than in others. When a piece of it was dissected off, and plunged into dilute muriatic acid, it immediately presented a remarkable degree of puckering and mammillation. On examining the cut edge of vertical sections of this piece, it was clear that the mammillation was chiefly the result of drawing together of the mucous membrane, or rather its corium. The mucous membrane was, as it were, folded and puckered minutely, but it was not at all constantly thicker, even in the least degree, in the prominent parts. Microscopic examination showed that its tubes were very healthy. When a similar piece was put into cold water it became puckered much in the same way, but rather less than the former. The corium contained numerous elongated nuclei, just such as are seen in organic muscular fibres; and the presence of these, as well as the longitudinally striated aspect of the layer, suggested strongly the idea that its tissue was in great measure contractile. I do not, of course, suppose that the corrugation which took place in acid and water was due to the action of contractile power, though it may have been produced by the shrinking up of the same tissue which during life had possessed contractility. Both in the mid region and in the pyloric, more particularly in the

latter, it appeared to me that the nucleated, and as I suppose contractile, tissue of the corium was prolonged upwards at intervals among the tubes around the larger blood-vessels. If this should be the case, the drawing in of the membrane at certain points would be still more easily effected. However its production may be explained, there can be no doubt that mammillation does often occur in very tolerably healthy stomachs.

But again, it will often be found that the mammillated appearance is presented by stomachs that are not so healthy, and that the mammillation depends in great part on the morbid change that has occurred. The mucous membrane in its normal state forms a nearly uniform layer, but it is not unfrequent to find it altered so as to be of very unequal thickness in spots closely adjacent. This change is best seen when it is dissected off and held up before the light; the glandular tube structure is then observed to be broken up into separate small masses, between which there is only a thin translucent expansion. Generally, the intervals between the masses of tubes are narrow and linear; in vertical sections they are seen as fissures of varying depth, sometimes dividing the mucous membrane quite down to its corium, sometimes notching it more or less deeply. They correspond exactly to the "sinuous depressions" mentioned by Andral which separate the mammillæ, as may be ascertained both by viewing the membrane against the light, and by carefully making a vertical section through two adjacent mammillæ and the intervening furrow. Close examination of these notches and fissures discloses not unfrequently some traces of the process by which they

appear to be formed. The sides of the depression are lined with nuclear particles, apparently the remains of a mass which had been formed at the surface and had gradually disintegrated. At the depressed part the tubes are more or less wasted and destroyed, according to the depth of the notch. Sometimes they are wasted at their deep ends, apparently also by the breaking up of a nuclear mass which had been there deposited and had involved them. This fissuring or local atrophy of the mucous membrane may exist in a marked manner without any manifest mammillation. In fact, it seems necessary that some degree of contraction of the corium should take place to make the phenomenon easily recognizable. Otherwise the distinction between the prominent unwasted parts, and the thinner spaces between them, may easily escape notice. The following case illustrates this condition. Case 21.—E. H., female, æt. 26, died after three or four months' illness with ovarian growths on both sides, and peritonitis with liquid effusion. About three weeks before her death she complained of having violent pain in the stomach after taking any food. Stomach contained much acid chyme. Splenic region : mucous membrane of uneven thickness, so that held up to the light it exhibited a multitude of opaque patches with intervening light furrows. In the mid region this was not the case, the mucous membrane was almost completely uniform. The tubes in the splenic region were tolerably healthy, but obscured in some degree by fibroid interstitial formation, which was seen especially encroaching upon them at their bases. There was also some generally diffused nuclear deposit, which was most abundant at two or three depressions

belonging to mammillating furrows, where the nuclei were seen lining the V-shaped surface. The basement membrane was sometimes absent. Mid region: tubes remarkably healthy. Pyloric region: tubes much atrophied, amid abundant interstitial nucleated fibroid formation, more so in some parts than in others. In the next case local atrophic change had proceeded still further. Case 22.—T. D., æt. 57, carpenter, a large and heavy man, fell from the top of a ladder and fractured his skull. Blood was poured out from the nostrils, mouth and ears. He died comatose. The brain was found much bruised; the organs all apparently healthy. The surface of the stomach was pale, covered with mucus, very acid, and containing a large quantity of black matter. Under the microscope, this mucus exhibited great numbers of large well-formed cells, evidently from the tubes, columnar epithelium, altered blood globules, and blood pigment. The surface in the splenic region at its lower part presented numerous spots of about the size of a pea, much more prominent than the intervening surface; and when held up to the light the tissue was manifestly much thicker and more opaque in those parts than elsewhere. These prominent spots were more numerous and closer together in the lower part of the mid region, at the upper part of which and in the pyloric there was marked mammillation. In the prominent parts the tubes existed in a healthy state; in the intervening thinner parts they were very much atrophied and wasted, amid an overwhelming infiltration of nuclei, with circumscribed nuclear deposits at the bases of the tubes, or in the corium. This was the case in the splenic and mid regions: in the pyloric there was nearly

the same condition, but the tubes were less wasted. This case, as well as the details above related, seem to me quite demonstrative that the organic change which takes place in marked morbid mammillation is an atrophic and not the opposite, even in appearance. The diseased part is manifestly thinned and not thickened, and it is the shrinking in of this part which leaves the more healthy prominent and forming mammillations. If we substitute the kidney for the stomach we find a precisely similar change recognized, only that the remaining tubes are, in this case, said to form granulations, and the kidney is not called mammillated but granular. With regard to the process by which the local atrophy is produced, it is scarce possible to speak with any certainty. We have seen that it is essentially connected with formation and disintegration of nuclear deposits, which must, in this case, almost certainly be of abnormal origin. But what this origin itself is, whether a pure simple error of nutritive action, or connected with hyperæmic flux, and what we call inflammation, I have no evidence to prove. The former, I think, is certainly more probable. Morbid mammillation, as Rokitansky states, is most frequent in the pyloric and adjacent part of the mid region, but it is by no means confined to this locality. It is often necessary to take some trouble to wipe off closely adhering tenacious mucus before the mammillated character can be well seen.*

* In a case I recently examined, the muscular coat of the stomach was much thickened, and traversed for a part of its depth by septa passing off from the submucous tissue, which was also much thickened and indurated. The mucous coat was pretty smooth in the greater part of its extent, presenting, however, numerous linear fissures. About the mid region it was thrown into several convoluted folds, which were so prominent that they were supposed at first to be a cancerous growth. In this convoluted

VI. *Ulceration*.—But little could be added in the way of general description to the excellent account which Rokitansky has given of ulceration in the stomach. It may be of advantage, however, to give short details of the examinations made of the cases of ulceration which I have met with. Several important points in this way may be well illustrated. Case 23.—M. S., widow, has had 11 children, charwoman, æt. 50, admitted into St. Mary's, Oct. 21st. Extreme congestion of face. General yellow tinge of skin. Urine scanty. No appetite. Bowels costive and extremely weak. Has, in general, had pretty good health, no illness of late years; has, however, had rather profuse menorrhagia lately, and subsequently leucorrhœa. About the same time her breath, which had been short on exertion, became shorter, and she got cough, palpitation, and anasarca of the legs. Feet and legs very cold and œdematous. Urine not albuminous decidedly. Post-mortem:—Much serous effusion in both pleuræ and in abdomen. Left lung œdematous and emphysematous. Right lung nearly consolidated in its lower lobe from effusion of blood. Heart flabby, many purpuric spots on its surface; mitral valve thickened, but tolerably efficient; other valves healthy. Kidneys very hard. Liver large, slightly granular. Stomach was

part there were distinct traces of the tubes remaining, but in the other regions they were utterly atrophied and reduced to fatty débris. The patient was a married female, æt. 34, who stated that she had always had good appetite and enjoyed her food till the last four weeks, during which she had suffered from sickness, which had gone on increasing. She died exhausted and emaciated. Besides some pneumonia and chronic hypertrophy of the aortic glands in the abdomen there was no important organic disease in other parts. The case illustrates well the position maintained in the text, as also the latent, unnoticed mode of progress of the degenerative disease in the stomach. How many more symptoms would have been complained of had the patient suffered from irritative dyspepsia!

rather large, presented a circular constriction $2\frac{1}{2}$ inches from pylorus. Internal surface pale and of natural appearance, except at lesser curvature on posterior surface, where there were two ulcers, a larger one quite circular nearer the pylorus, and a smaller oblong one nearer the cardia. Their edges were evenly rounded, not much thickened, and devoid of the least vascular injection. There were no adhesions externally corresponding to the ulcers. There was much acid fluid in the cavity of the stomach. The tubes in all the three regions were very healthy, with some little interstitial nuclear formation in the mid and pyloric. General, and especially cardiac, debility seems to have been the cause of the fatal event in this case. The ulcers existed in the midst of healthy structure, and produced no special symptoms. Case 24.—R. W., æt. 54, shopman, admitted Oct. 21st, 1853. Had good health till within last five years, since then has been ailing more or less with pain in chest and side. Some symptoms referable to the brain appeared about two years ago, but he kept about till the last fortnight. He died comatose in one or two days after his admission. Post-mortem :—There was a scirrhus tumour, the size of a fist, in the posterior part of the right hemisphere of the brain. The left lung was firmly adherent posteriorly and partially condensed. Adhesions existed around the upper and left portions of the stomach, uniting it to the left lobe of the liver, to the spleen, and to the diaphragm, and the commencement of the descending colon. These adhesions were evidently caused by an old ulcer of the stomach, as shown by a long and puckered cicatrix passing transversely across the cavity and contracting it in an hour-glass fashion. Other viscera

healthy. The contents of the stomach were very acid. The tubes in the splenic and mid regions were healthy, in the pyloric they were exceedingly obscured by interstitial nucleated fibroid formation. The production and the healing of the ulcer seem to have taken place spontaneously, but not without symptoms. The tissue around was for the most part healthy. Case 25.—J. M., æt. 49, admitted into St. George's, Dec. 21st, having had cough and short breath since September. Dropsy the last week in legs. No rheumatic tendency. Urine scanty, clear, albuminous. Pericarditis was discovered on 23rd, he had a fit the same night, after which he remained partially comatose, with paralysis of right arm. Died comatose on 26th. Post-mortem :—Lungs rather emphysematous and œdematous, lower and back part of right partially consolidated and softened. Fibrinous and serous exudation in pericardium. Ventricles, especially the right, dilated, and the auric-ventric. orifices enlarged. Walls of heart of ordinary thickness. Atheroma in mitral valve, and considerable induration of aortic flaps at their bases. Traces of recent peritonitis and fluid effusion. Kidneys large and cysted, surface of one highly granular. Liver large with rounded margins. Spleen large, firm, and hard. Blood generally very fluid. Stomach : its mucous lining much injected in places, it contained much bilious fluid of neutral reaction. Its aspect did not appear healthy, it was mottled and not smooth ; the pyloric region was darkened extensively by black pigment. There was a large ulcer the size of a florin or half-crown piece on the posterior wall, at about the junction of the splenic and mid third, and another smaller ulcer on the anterior wall ; both these had

clean cut adherent margins. Near the large one on its left side was the firm cicatrix of an old healed ulcer. The smaller ulcer was of an oblong shape, its bottom was formed by condensed areolar tissue infiltrated on its surface and for a little depth with granular exudation containing a few nuclei; the surface was ragged. The larger ulcer was circular, its bottom was formed by fibres of the muscular coat dissected clean. Splenic region: tubes are very tolerably healthy, but nuclear deposits are seen in some parts at their bases and extending among them. Mid region: tubes obliterated by interstitial nuclear and fibroid formation almost completely, basement membrane destroyed in some parts. Pyloric region: tubes very much obscured by nucleated fibroid infiltration, and degenerating fattily. The basement membrane of the surface was very indistinct, the black pigment in this part formed masses lying in the superficial stratum of the mucous membrane. The tubes in the vicinity of the smaller ulcer were tending to disintegrate, but still tolerably distinct; there was a great deal of nuclear deposit diffused among them, and in some parts the capillaries were much congested. The muscular coat was hypertrophied at and near the pylorus. Here there was renal and heart disease, the latter probably consecutive; cirrhotic change probably in the liver, and similar morbid action in the spleen. The stomach was materially diseased by atrophic change in its mucous membrane besides the ulcers. The larger ulcer was, it would seem, in process of extension, the tissue melting away as it advanced, and not infiltrated by any exudation or deposit, much as in the case of a perforating ulcer of the cornea.

Case 26.—A. R., æt. 74, female, admitted into St. Mary's, Jan. 1st, insensible; pupils contracted, not acting; vomiting frequently. She fell down suddenly while walking across her room. Died next day. Post-mortem:—Body emaciated, no dropsy. Angular curvature of dorsal spine, bones not diseased. Heart healthy. Lungs engorged and condensed at back parts. Both kidneys granular; liver healthy. There was a clot of blood and some serous fluid in the left ventricle of the brain. Stomach: surface pale, covered with much slimy, transparent, strongly acid mucus. There was mammillation in the left part of the pyloric region, and about the lesser curvature in the mid region. At about the commencement of the pyloric third, and on the posterior surface, there was an ulcer with smooth thinned edges, and of squarish shape, which penetrated quite down to the muscular coat. At its base was seen a vessel quite exposed. Splenic region: tubes tolerably healthy; it appeared that their secretion furnished the covering mucus of the surface. Mid region: tubes very healthy. Pyloric region: tubes perfectly healthy and unobscured, the epithelium in their lower ends was very fatty. Examination of vertical sections of the ulcer showed nothing remarkable at the edge of the mucous membrane; it simply ceased, generally by a rather abrupt edge. At some parts the edge, however, was thin and blended with the exposed submucous tissue, in others it was thicker and somewhat undermined. Nowhere could any special alteration be seen, only largish vascular trunks crossing underneath the ulcerating surface. The ulcer, in this case, occurred in the midst of structure more than average healthy, considering the time of life.

The only marked atrophic change was that of the kidneys; the vessels of the brain were probably in a state of fatty degeneration also. The numerous vessels crossing the base of the ulcer showed how great was the peril of hemorrhage.

Case 27.—J. O., æt. 48, admitted into St. George's, Jan. 9th. Had ruined his health by drinking; looked ten years older than his alleged age; was exceedingly weak. Had a fall lately, by which he bruised his chest severely; much blood was extravasated in front of ribs on right side. He had suffered from cough and pain in that side a long time. A small venesection relieved his dyspnœa much, but he soon sank into a state of extreme prostration, from which he did not rally, and died, January 11th. Post-mortem:—Body muscular, and in good condition. A large quantity of turbid, dirty, greenish, sero-purulent fluid in the right pleural cavity, and thick layers of recently-effused fibrine covering the membrane. Heart and lungs healthy. Right ribs not injured. Abdominal viscera healthy. Stomach large, rugæ not much marked, colour of surface darkish, except in the vicinity of the pylorus, where it is bile-stained, and about lesser curvature, where it is marbled. Reaction feebly acid. A kidney-shaped ulcer on the posterior wall, near the lesser curvature. Splenic region: tubes show a decided tendency to disintegrate, although their epithelium is abundant; it seems as if they were losing their walls of basement membrane; the vessels are much injected. Mid region: tubes indistinct, but epithelium abundant. Circumscribed nuclear deposits exist, as well as diffused nuclear and fibroid formation; at the edge of a section there are seen fibre-forming and

elongated nuclei. Pyloric region: tubes much obscured, and rather wasted by interstitial nuclear and fibroid formation; there are also some separate nuclear masses. In the neighbourhood of the ulcer there are some dark red spots of small size, which seem to be the result of extravasation. One of these, examined under the microscope, shows black granules and globules scattered through the mucous membrane. The dark colour of the mucous membrane and the spots of extravasation show that vascular congestion, to some considerable extent, had existed in this case. It is not impossible that the ulcer might have originated in a larger patch of extravasation by what Rokitansky terms the process of hemorrhagic erosion. The power of the general system was greatly depressed, and probably had been so for some time, which no doubt promoted the formation of the ulcer. There was no degenerative disease of the other organs. Case 28.—H. S., potman, æt. 56, admitted January 16th, into St. George's. Is in the habit of drinking five pints of porter, besides gin, &c., daily. He fell down suddenly and vomited. Is unconscious, has hemiplegia of right side, pupils extremely contracted. Had eaten a hearty dinner the day he was attacked. Post-mortem:—Skin yellowish. Central parts of brain much softened, hemorrhage into the ventricles, especially the left. Corpus striat. and opt. thal. of this side broken down. Lower and posterior parts of both lungs engorged with reddish fluid, and softened. Left ventricle of heart thickened. Some atheroma of mitral valve, coronary arteries and aorta. Intestines natural. Liver cirrhotic to a considerable extent. Capsule of spleen opaque; the organ itself firm and

hard. Kidneys congested and granular, cortical parts wasted. Stomach presents a surface of pinkish tint, not quite even, smeared with tenacious mucus of bilious tint and neutral reaction. Near the pyloric region and lesser curvature there are some spots of the size of a small pea, which are manifestly commencing ulcerations, and are infiltrated by hemorrhagic exudation. The mucus consists of tenacious plasma, imbedding débris of tubular and columnar epithelium with crystals, which appear to be those of triple phosphate. Splenic and mid regions: tubes very healthy. Pyloric region: tubes very much obscured, and more or less atrophied, amid a copious infiltration of nuclear formation, with granular and fibroid substance. In the deeper parts of the membrane there are large nuclear deposits containing diffused oily matter. The surface is covered by minute crystals, which behaved like triple phosphate. A section carried through one of the blood-stained ulcerations shows the surface sunk, the basement membrane gone, and the tubes quite destroyed, with a kind of fibroid tissue in their place, which is infiltrated with diffused yellow pigment. In this case there was marked degenerative change in the liver and kidneys, and probably in the cerebral blood-vessels. The pyloric region of the stomach was far advanced in morbid change, such as has been described in section IV., which bears a good deal of resemblance to that taking place in cirrhosis. The stomach was affected with chronic catarrh, which was probably induced and kept up by his habit of drinking stimulants in excess. The small ulcerations, which exactly correspond to Rokitansky's description of hemorrhagic erosions, bear some resemblance to the varicose ulcers

which occur on the legs in their early stage. As the liver was cirrlosed, there is the more probability that they did actually thus originate from obstruction to the current of the blood. However, though I incline to the belief that they essentially depend upon local stagnation of the blood, and consequent disintegration of the tissue in the affected spots, I would not assert that this stagnation of the nutritive fluid was always occasioned by hinderance to its passage in the onward direction. No doubt, a local morbid action (as in inflammation), impairing the nutrition of the part, may have the same effect.* For the following interesting case I am indebted to the kindness of Mr. Sedgwick : Case 29.—J. V., æt. 82, widower. Has kept a public house, and been well-off until about ten years ago, when he got into difficulties, and was obliged to give up business. Has been in the workhouse for the last four years. Has generally lived well, but moderately, drinking chiefly beer, and sometimes a little wine. Has suffered for many years from asthma, and coughs a good deal in cold weather. For the last thirty years or more he has suffered from “heartburn,” for which he has accustomed himself to take magnesia, and has been in the habit of carrying some about with him. The heartburn came on very severe im-

* I have lately seen a case in which both legs were much discoloured by coppery stains at their lower parts, with some amount of anasarca, while a cachectic, extending ulcer had formed on one near the ankle. The condition was exceedingly similar to that which is observed in ordinary cases of varicose veins. I could not find, however, that the veins of the legs were enlarged; the only discoverable cause appeared to be a morbid state of the blood. The pulse was weak, the circulation feeble, the general power low. Here the ulcer must have resulted from the languid movement of the impoverished blood, and consequent failure of nutrition. It is quite possible that the same might occur in the stomach, especially when its tissue was weakened by abnormal stimulation.

mediately after dinner, so as to oblige him at once to take magnesia for it. His friends, and all who have been about him, agree in stating that he never vomited. The chief symptom he suffered from was pain, burning and deep-seated behind the sternum, which was increased and became sometimes very severe when the stomach was distended. Bowels generally very regular. During the last three months the pains in the epigastrium have been more acute, and treatment has been more specially directed to the stomach. More relief was afforded by hydrocyanic acid than by anything else. He had also taken bismuth, camphor, and opium. On February 2nd, 1854, he was taken much worse about 11½ A.M., with pain much more severe than usual in the pit of the stomach, and was "doubled up with pain." He described the pain in the stomach as being dreadful. Late in the evening of the same day, soon after taking some medicine, he complained of feeling sick, but did not vomit; this nausea continued up to the time of death. He had not felt sick before taking the medicine. He passed the night in great suffering, complained of feeling his mouth parched, and said the pain was so agonizing that he wished to die. He had had a collapsed look from the time of his fatal attack, passed no urine, and the bowels remained confined, as they had been during the previous day. His death occurred at 9 A.M. of the 3rd, in the way of asthenia; he had been set by the nurse on the night-stool, "came over very faint," and was with difficulty helped back into bed, and did not rally. Post-mortem:—Body well made, thin, but not emaciated. Both lungs very emphysematous. Heart healthy. Abdomen

contained a large quantity of brown flaky fluid; viscera in the neighbourhood of the stomach covered with lymph, and adherent to adjacent parts. Liver and spleen healthy. Kidneys both presenting evidence of granular degeneration: left most affected. Bladder empty. Stomach adherent to adjacent organs, the adhesions easily broken down. On raising the anterior edge of the liver a round aperture is seen on the anterior surface of the stomach, near the pylorus, from which the contents of the stomach escape. No vascularity noticeable externally round the ulcer. The perforation externally is circular, with sharp, clean, well-defined edges, $\frac{7}{16}$ ths of an inch in diameter. It lies 1 inch to the left of the pylorus, and $\frac{3}{4}$ inch below the lesser curvature. On slitting open the stomach along the greater curvature, it is noticed that the pyloric third of the stomach is much mammillated; this condition extended also into the splenic region. The surface was quite pale, not covered by any mucus, and gave an acid reaction. Splenic region: tubes very tolerably healthy. Mid region: tubes very healthy, much convoluted. Pyloric region: tubes tolerably healthy, but mingled with interstitial granulo-fibroid matter, and tending to waste, and have their lower ends gathered into bunches. The ulcer was of an ovoid form, with rounded, not elevated margins, the mucous membrane being drawn in, and tucked over, and attached at its edge to the wall of the excavation. The ulcer had perforated the whole thickness of the stomach wall, but at its lower two thirds the opening was blocked up by an enlarged and indurated gland. The bottom of the ulcer was of a yellowish grayish aspect, and presented at its left side a prominent

papillary eminence with a black spot at its top, apparently a blocked-up vessel. A portion of the base of the ulcer presented, under the microscope, disintegrating low fibroid tissue, a few nuclear corpuscles, some of them elongated, groups of disintegrating fat cells, and interwoven mould filaments. In another specimen from the same the corpuscles were very numerous, and there were numerous isolated yellow elastic fibres with much granulous matter, and low fibroid, as in the other. In one part there was seen a round spot about the size of a pin's head, which had a distinct capsule of fibroid tissue, such as existed generally in the base of the ulcer. The contents of this cavity were found to be the coats of a largish vessel shrunk together, the fenestrated membrane being particularly distinct. This case is of great interest, from the length of time the affection had probably existed, and the precise history of the condition and symptoms of the patient. It presents two or three points of peculiarity. Rokitansky states that the disease occurs chiefly at the period of puberty, and very often as early as the fifteenth year. In this man the fatal event did not take place till extreme old age, and even if we date the commencement of the ulcer from that of the heartburn, it could not have existed before the age of 50. Rokitansky also states that perforating ulcer is invariably accompanied by chronic catarrh: this was not so in the above instance. It is rather remarkable, that while the ulcerating process went on to perforation, several vessels were found in the base of the ulcer safely sealed up, and no hemorrhage from the stomach ever occurred. The long-abiding pain, relieved by sedatives and magnesia, might have ex-

cited suspicion of the existence of an ulcer in the stomach, but could hardly have been distinguished in the absence of other symptoms, during so many years, from mere gastrodynia. There was but little trace of degenerative disease in the other organs; the lungs and the kidneys were both moderately affected, but, considering his advanced age, the general system seems to have been in a very tolerably healthy state. The stomach in particular was unusually healthy. Case 30.—H. G., female, æt. 55; admitted into St. Mary's Hospital, May 10th. She had been ill about one year. Her symptoms were, in the main, those of pulmonary and gastric catarrh, the latter predominating. The liver was much enlarged, extending down almost as far as the umbilicus; it was not pushed down, nor was the heart overlapped by lung. A very loud mitral systolic murmur had existed, but was much more feeble, indeed scarce audible, while she was in the hospital. She had frequent nausea, and almost constant sickness in the morning, but at one time she was able to eat a little meat, and take porter for dinner comfortably. The matters vomited were mostly watery fluid, with more or less tenacious mucus and débris of food: the reaction was sometimes acid, sometimes faintly so, or not at all. The urine was throughout albuminous, and contained casts of the renal tubes both corpuscular, granular, and oily. She became extremely emaciated, the sickness continued at night and in the morning, and she sank August 9th. Post-mortem:—Heart and lungs very tolerably healthy; the mitral valve appeared to be quite efficient, though there was a little nodular thickening on the auricular side. Liver enlarged, of a pale red; its

cells contained yellow pigment; the Glissonian sheaths were thickened, and there seemed to be some fibroid formation taking place in the lobules. Kidneys small, cortical tubes broken up, many fibrinous casts in medullary. Stomach large, adherent posteriorly to the pancreas, at lesser curvature and adjacent parts of anterior face, adherent to the left lobe of the liver. On raising the edge of the liver the adhesions gave way, and there was exposed a large perforating ulcer, which had completely destroyed the wall of the stomach over a space larger than a crown-piece. The mucous membrane in the splenic region was pale, in the mid region and pyloric was much darkened by streaky deposit of pigment. Close to the pylorus the surface was pale. The tubes in the splenic region showed a considerable tendency to waste, and in some spots there were large massy and infiltrating nuclear deposits. Mid region: tubes in some parts tolerably healthy, in others they were obliterated, but the basement membrane persistent, the space beneath being occupied by fibroid and nuclear stuff imbedding black pigment grains, and by large nuclear masses at the deepest level. Pyloric region: tubes completely obliterated by nuclear and fibroid formation, much black pigment deposited in some parts; mucous membrane much thinned in this, as also in some parts of the mid region. Duodenum: the structure was tolerably healthy, but there was a large quantity of black pigment in many of the villi, in the form of grains and masses. The basal surface of the ulcer formed by the pancreas, whose glandular tissue was exposed (and as well as that of the liver ulcerated, I think, to some extent), showed no injected vessels, nor

anything under the microscope but abundant granular matter and imperfect stunted celloid corpuscles. The margin of the ulcer was very thickened and callous, a vertical section of it showed much white induration matter in the submucous tissue, and beyond this the mucous membrane could be traced down the side of the ulcerated opening, being, as it were, turned in and tucked over, and appearing as a smooth varnish, which gradually was lost. Its structure consisted of an imperfect fibroid tissue, with broken-up epithelial remnants, pervaded extensively by a growth of mould filaments. A portion of tissue from the very extreme margin of the ulcer, just where it passed on to the base, consisted of fibroid tissue infiltrated by granular matter with some oily and pigmentary, and presented a few crystals of triple phosphate.

In this case the ulcer was quite latent; there were no symptoms which could have led to its diagnosis. The nausea and vomiting, in all probability, depended solely on the existing catarrhal condition, which was of old standing. The ulcer was evidently extending, as may be inferred from the condition of its base; the exceeding depression of the vital power rendering all reparative effort impossible. The microscopic examination of its base and margin shows, beyond doubt, that the ulcerative action consists in simple disintegration and liquefaction of the affected part, not in the softening and breaking-down of any previously-deposited exudation. The extension of the ulcer does not take place, therefore, in the same way as that of a tuberculous. There was degeneration of the kidneys, gastric mucous membrane, and liver. The occurrence of a loud murmur, with apparently efficient

valves, and no cardiac hypertrophy, is a fact of interest.

These eight cases of ulceration were met with in 103 post-mortem examinations taken indifferently, the last two cases excepted. (Two only were females, the rest males.) None of them were under 48 years of age—their average is 58·5. This result, again, is counter to the statement of Rokitansky (Anat. Pathol.), which is corroborated by Dr. Copland, that young females are the most frequent subjects of this affection. Such was, certainly, my own impression before I commenced these inquiries, and such seems to be the opinion of Dr. Budd. He says (Lectures on Organic Diseases of the Stomach, *Medical Times and Gazette*, June 18th, 1854): “It seems to be much more frequent, even considering their relative numbers, among the poor, than among the rich, and, in this country, is generally supposed, and I believe rightly, to be more frequent in the class of maid-servants, between the age of 18 and that of 25.” He quotes, however, from Rokitansky an analysis of no less than 79 cases, the result of which, as regards age, coincides with that which I obtained on a small scale. The number of persons who were affected, above 50, was greater than that of those below 30. In Case 25 the ulcers occupied an unusual locality, being situate on the confines of the splenic region instead of in the pyloric. In 4 of the 8 cases, the mucous membrane of the stomach was found, by microscopic examination (the only sure test), to be quite healthy in structure; in 2 the greater part was tolerably healthy, the pyloric region only, as is so commonly the case, being the

seat of interstitial fibroid formation; and in 2 both the mid and pyloric regions were considerably diseased. From this it is sufficiently clear that general degeneration of the mucous membrane, spoiling and wasting of its tubes, contributes nothing in the way of causal agency to the ulcerative process. As to the coexisting morbid conditions of other organs, there does not seem to be, as Dr. Budd remarks, any intimate connexion between them and the disease in the stomach. In 3 of my cases the organs were generally healthy, except a cancer in the brain of one, and accidental pleuritis in another. In 4 there was decided renal degeneration, and a slighter degree of it in a fourth, with considerable pulmonary emphysema. In one of the cases where the organs were healthy, the general strength was utterly broken by parturition and maternal cares of 11 children, menorrhagia and leucorrhœa, and, doubtless, hard labour. The same result had been produced in a second (Case 27), by the habit of intoxication. Thus there remains only one in which there was not some tolerably sure indication of general or local failure of vital powers in other parts besides the stomach. This is a point of considerable importance. The ulcerative process in the stomach seems to me to resemble very strongly that which takes place in the cornea in cases of deficient general power. There is manifestly an arrest of the normal assimilative action, the natural tissue is not nourished, but deliquesces, and is absorbed or flows off. The more clean cut and level the edges are in both cases, the less is there any reparative effort. Raising and tumefaction of the margins in the mucous membrane, which is free to move, and opacity from deposition of plasma in the

transparent cornea, are the evidences of repair having commenced. A tonic treatment is well known to obtain the cure of the ulcer in the external structure, and it seems highly reasonable to suppose that it would avail equally in the case of the internal. To this point I shall again return. I have not separated the case of hemorrhagic erosion from the others, although it might have been more correct to do so, partly because the microscopic examination afforded such conclusive evidence of the complete destruction of tissue which had taken place, and partly because Rokitansky considers it probable that the perforating ulcer commences by one of these erosions. Some additional probability is given to this opinion by the experiment performed by Mr. Simon, which Dr. Budd records. It was found that, after three weeks of confinement in the dark, the stomach of cats "presented several irregular linear abrasions of the mucous membrane," "resembling the linear hemorrhagic erosions of the human stomach." These ulcerations were evidently the result of enfeebling influences acting on the general system, and through it on the stomach, not of any inflammatory process set up in the stomach itself. They have thus a manifest resemblance to the larger ulcers of the human stomach, which, as we have seen, are prone to appear in a system which betrays some indications of failure of vital energy.

For the following unusual case I am indebted to the kindness of Dr. Bristowe, from whom I received the specimen and the history. Case 31.—E. C., a girl, æt. 12, died, after about a month's illness, of copious intestinal hemorrhage, occurring in the course

of typhoid fever. There was hepatization and purulent infiltration of a large portion of the left lung. The lower part of the ileum presented numerous ulcers; these, however, were most extensive in the cœcum and ascending colon, which had been the seat of the hemorrhage. The mucous surface of the stomach was thickly studded with depressions of a circular or irregular form, and varying in size from the diameter of a silver penny to one-fourth that magnitude. They were rather paler than the surrounding membrane, but many of them were dotted with black points. They existed all over the stomach, except for an inch or two near the pylorus. Their margins were not sharp cut, but evenly rounded over. The depressions were much more translucent than the surrounding tissue, and it appeared clear that a loss of substance had taken place. In vertical sections, under the microscope, the mucous membrane in the vicinity was seen to be quite healthy, the tubes perfectly natural, but in the depressed parts the tubes were reduced to mere granular debris, and the basement line of the surface was lost. There was a great deal of oily matter in the disintegrating tissue and just beneath it. There was no particular change in the sub-mucous tissue. The surrounding healthy tissue passed rather abruptly into the disintegrating, and there was no deposit or morbid formation, of any kind, in the parts affected. No injected vessels were seen by the microscope, nor any pigmentary deposit. The change in this case seems to have been more akin to sloughing than ulceration; it occurred in an emaciated, debilitated girl, and was evidently quite unconnected with any inflammatory action. The instruction which the

case furnishes, and for which I record it, is to the effect that it shows how, in conditions of very impaired nutrition of the general system, a local decay or atrophy may take place in numerous spots of a part where no inflammatory or other special diseased action is going on. Though diverse from ulceration this local atrophy has a strong family resemblance to it, and it occurred under very similar circumstances to those which seem to favour ulceration.

(VII.) *Changes in the epithelial contents of the tubes.*—Though some of these have already been adverted to, it may be well to make more particular mention of them here. They may be enumerated as, (1), fatty degeneration; (2), simple wasting; (3), black discoloration. These are all that mere inspection can distinguish, but it is almost certain that other not less important alterations take place, affecting the vital endowments and qualities of the epithelium, which cannot be recognized by the eye, and concerning which chemistry has as yet given us no information. It is not infrequent, on examining the mucous surface of the stomach, to find a patch of variable size, as large, perhaps, as the palm of one's hand, of a dull dead white aspect, contrasting very much with the surrounding grayish tint of the healthy membrane. This condition has been noticed by Andral, who refers it to the effects of chronic inflammation, and adds that he has always found it combined with other alterations, such as thickening and induration of the membrane. These I have not observed. The opaque white patches are generally not definitely circumscribed, but pass gradually into the paler surrounding surface. The white colour of the patches depends upon

fatty degeneration of the epithelium of the tubes. A comparison of a vertical section from the altered, with one from the more healthy, part of the same stomach will show some striking differences between the epithelium in the two. Where the fatty change has taken place the cells are much smaller than natural, shrivelled and stunted in appearance, of angular or irregular shape, and consist of granular matter mingled with varying proportions of oily, which does not exist as distinct drops, but is uniformly diffused through the mass. There is but little free granular matter, the cells lie packed close together, and their outlines are apparent. The cells sometimes contain nuclei; sometimes none are visible. There are but few free nuclei, and those which can be found look shrunk, withered, and collapsed, extremely unlike healthy ones. The epithelium from healthy tubes of the same stomach, consists of large plump oval or round cells, in which some oily molecules lie amid a mass of soft, granulous matter; multitudes of beautiful, perfectly spherical or oval nuclei, each with a single nucleolar spot, are floating freely all over the field, or are mingled into a mass with free, granulous matter. The cells from the healthy are nearly double the size of those from the fatty part. Fatty degeneration may proceed to a much greater extent, so as to cause the disintegration of the tubes, which appear then as mere strands or cylinders of oily and granulous matter, or are completely broken down. In other instances, where the mucous surface of the stomach presents dead white patches, the epithelium, though decidedly fatty, is found not to be wasted. The cells are of good size and consistence,

though they contain much oil. Similar varieties are observed in the parenchyma of fatty livers. Sometimes the cells are extremely broken up, and reduced to a mere mass of oil drops entangled in granulous films, sometimes the cells remain very perfect, and are only distended and enlarged by extraordinary accumulation of oil. Out of five cases, in which I observed a fatty condition of the epithelium to a degree that might be considered abnormal, there were three in which death occurred from phthisis, and in two of these the liver was fatty. It was very fatty also in the fourth case, that of a female who died from uterine cancer. In the fifth case death occurred from pneumonia, with an hydatid in the left lung, but I have no record of the state of the liver. As far as these figures go, there seems reason for considering the fatty change in the glandular structure of the stomach to be akin to, and sometimes concurrent with, the fatty change in the liver. It is quite clear it is not an indication of gastritis. I have already mentioned the frequent occurrence of much oily matter in the epithelium of the lower part of the tubes, which is not to be regarded as a morbid state. A fatty state of the epithelium is often observed, also, under other circumstances, especially in the pyloric region. When the upper parts of the tubes become more or less completely obliterated, and the lower are thrown together into groups, the epithelial contents of these parts become remarkably opaque and fatty. This change affects the nuclei rather particularly, they lose their nucleoli, and become more or less filled with oily molecules, at the same time increasing in size (many of them)

considerably, so as to appear like small glomeruli. Much free oily matter also surrounds the nuclei, but the cells do not take it up, they give place entirely to the altered nuclei. I have seen very similar alteration of the epithelium of the tubes in an atrophied testis.

Simple wasting of the epithelium of the tubes, shows itself generally not so much by manifest diminution of the quantity contained in them, as by alteration of its particles. The cells are very small, often mere shadowy films of granulous substance surrounding the nuclei; or mere non-nucleated granular globules, and the nuclei themselves are less plump and perfect than natural. Sometimes the epithelium becomes so wasted, that it forms a mere lining to the tube, instead of filling up its cavity; it is then apt to separate in tubular fragments, which have much more cohesion in themselves than would be the case with the normal cell growth. This simple wasting does not seem to be peculiar to any particular morbid condition. It is, I think, most probable that even where the tubes are filled with the epithelium wasted, as just described, this substance is not thrown off in proper quantity, and that the secretion of gastric juice is consequently very defective. Minor degrees of this condition doubtless exist in numerous cases of weak digestive power.

Black discoloration of the epithelium depends upon the presence of pigmentary matter, in the form of various sized grains or granules within the tubes. These are accumulated, in greatest number, in the lower blind ends of the tubes. Interstitial deposit of pigment may coexist with this state, or be absent. In

one instance, the patient had been in the habit of drinking to excess, and died with typhoid pneumonia, cirrhosis of the liver, and granular renal degeneration. The stomach was tolerably healthy in structure, except in the pyloric region; there was interstitial deposit both of black and yellow pigment, besides the intratubular. Here there can be little doubt, that the black matter both within and without the tubes was simply altered hæmatine; the condition of the liver, and the frequent irritation of the stomach by stimulants, would necessarily induce a state of hyperæmia, of which a sanguineous exudation would be a natural result. In another instance already alluded to, (p. 90,) the patient died with tubercular peritonitis, and pulmonary tubercle and engorgement. The black matter which was so abundant, as to give the mid and part of the pyloric region a blue-black colour, was situate solely in the interior of the tubes; there was no apparent vascular injection, the submucous tissue was quite white; the blackened tubes were remarkably healthy, and free from interstitial deposit; the surface was covered with alkaline mucus. I should have felt some difficulty in attributing the black discoloration in this case to the same cause as in the preceding, had not Andral recorded two cases of chronic peritonitis, (p. 865, 866, Clinique Médicale, Spillan's transl.,) in which copious vomiting of coffee-ground matters occurred during life, while the stomach was found after death apparently quite sound, and pale. The coffee-ground matter, one cannot doubt, was altered blood, and the occurrence of such vomiting shows clearly, that the gastric mucous membrane had been the seat of hyperæmic afflux, which had dis-

appeared before the autopsy. In the case which I have cited above, the hyperæmia seems to have been much more gradual, and attended with less strain on the vessels. However, though there can be no question that hyperæmia is the most common and efficient "moment" in producing black discoloration, it seems to me, I confess, scarcely safe to pronounce that it is the only one. The very frequent formation of black pigment in the interstices of the air cells of the lungs, in the substance of various tumours, and the frequent occurrence of chloasmata in the skin, are sufficient to show that abnormal pigmentary deposits are no very wide or extraordinary deviations from the type of healthy nutrition, and that they are by no means necessarily dependent on hyperæmia. In one instance, where manifest altered blood was found on the surface of the stomach, I observed black pigment *in* several of the epithelial particles from the tubes. It was not merely mingled with the epithelium, but contained along with granulous matter in its cells. The tubes were tolerably healthy. Here, one is inclined to say, the nutrition power of the epithelial particles must have remained little impaired, as it seems to have used the exudation tinged by hæmatine, for the formation or growth of the cells. Three degrees of energy in the nutrition of the epithelium seem to be marked by the situation of the black matter; the lowest is that in which the pigment is deposited solely between the tubes, or indeed mingled with their débris, as in Cases 5 & 9; the next is that where the pigment lies at least partly within the tubes mingled with the epithelium, and perhaps replacing it to some extent; and the third

is marked by the presence of the pigment actually in the interior of the cells.

It seems proper to consider here rather more closely, how far there is any reason to regard any of the three first-mentioned alterations as the result of inflammation. To do so is the more necessary, as Virchow, (an authority of high repute,) has lately directed attention to what he calls Parenchymatous inflammations. An admirable review of his paper is contained in the twenty-fifth number of the Quarterly Journal (British and Foreign). Virchow, as the reviewer states, applies the term parenchymatous inflammation "to those inflammatory processes in which the characteristic and essential changes are met with in the elementary components of the tissues, without any appreciable exudation taking place, either into the interstices of the tissues, or upon the free surface of membranes." This definition may almost include any textural change whatever, and of course those which we have just described would be comprehended by it. Parenchymatous inflammation of muscle, Virchow describes as taking place, if acute, by a replacement of the sarcoous elements, by a molecular proteine substance; if chronic, by a process which British observers call simply fatty degeneration. The analogous process in the kidney is, according to him, the essence of Bright's disease, and is thus described: "In the first stage the epithelial cells of the cortical tubes enlarge, and their molecular contents increase. In the second stage this increase may reach such a degree, that it leads to the complete breaking down of the cells, in consequence of which the canaliculi appear filled with a molecular albuminaceous sub-

stance," called at Vienna "lardaceous infiltration." The cells may also undergo the fatty metamorphosis. Selecting the cornea as an instance of non-vascularized tissues, Virchow excited inflammation in it by means of irritants applied locally, and declares that "in no case did he find any free exudation between the lamellæ of the cornea, or between the single fibres." When we look at Mr. Bowman's drawing of the structure of the cornea, in the *Physiological Anatomy*, and remember that there is such a pathological condition as *onyx*, this statement seems to us simply incredible. We do completely agree with the able reviewer, that it is scarcely possible to imagine that exudation can take place into the elements of a tissue, and not into the interstices of the elements. This interstitial space must be traversed by the exudation, whether in the process of normal nutrition, or in that of inflammation. The point for consideration is: Can that be regarded as an inflammatory condition, in which there is merely textural change and no interstitial exudation? The answer to this of course depends on what may be thought to constitute inflammation. My view on this matter is, shortly, as follows: Inflammation, as is generally allowed, is a disturbance of the normal nutritive process, in well-marked instances of which the following phenomena are plainly recognizable. (1). Increased afflux of blood through dilated arteries. (2). Stasis of blood in certain spots of the area involved. (3). Exudation of red-stained liquor sanguinis into the interstices of the tissues, producing, together with the vascular distension, tumefaction of the part. (4). Arrest of the functional

powers of the tissues involved more or less completely, of which a good example is afforded by the paralysis of inflamed muscle, as in the intestine and elsewhere. Now these being the essential features of the typical case, I contend that in proportion as one or more of them are more faintly exhibited in any process, in such measure exactly does that process depart from the inflammatory character. I do not pretend to draw a line of demarcation between inflammation and mere hyperæmia (congestion), nor do I know the exact point at which exudation becomes mere deposit, as in the case of chronic tubercle and bacony matter. I believe the types of inflammation, passive congestion, healthy nutrition, abnormal deposit, and degeneration, or unhealthy nutrition, are clear, definite, easily distinguished, and far apart; but I know well that the spaces between are filled up with an infinite multitude of gradations, not seldom blended and intermingled one with the other; those approximating to one type, with those which have most affinity to another. If Virchow, then, regards a pathological condition, where there is nothing but textural change, as inflammation, I can only say that the distance between the type of inflammation and that condition seems to me so great, that I must look upon the latter as something very different; I should call it simply a degeneration, or mal-nutrition of a tissue. In the case of Bright's disease, as Virchow describes it, there is, to my mind, the simple fact of unhealthy nutrition, and any ascription of this to inflammatory action appears to me perfectly gratuitous. In the same way, I cannot see that there is any adequate reason for regarding inflammation as an efficient

cause of the two first changes in the gastric epithelium above described. I believe them to be simply examples of mal-nutrition. With regard to black discoloration, I think the evidence is very strong that hyperæmia is essentially concerned in it, at least in most cases; but at the same time where there is no intertubular exudation, and the tissue retains its normal structure; I should look upon the occurrence, rather as an instance in which the normal nutritive action had been modified by a perturbing cause, viz., the exudation of hæmatine containing fluid, rather than as an indication of actual inflammation. Catarrhal inflammation, as already stated, affects the tubes so far, that their epithelium is thrown off more rapidly than natural; this at least seems to be a fair inference from the presence of numerous cells from the tubes in the mucus. Such abnormal shedding of the epithelium is owing rather to excitement and irritation of the surface, than to inflammation of the deeper layers of the mucous membrane.

(VIII.) *Softening of the Stomach.*—That this may be a mere post-mortem alteration has been demonstrated by experiments so well known as not to need repetition here. It has been clearly shown that in animals and human beings dying in perfect health the parietes of the stomach have been found softened or even perforated. The observations of Hunter, Carswell, and Camerer are quite conclusive as to this point. It is hardly so well established that softening may also occur as a morbid process going on during life, but still the evidence in favour of this view is such as makes it almost certain. Full

descriptive details of these alterations in the coats of the stomach are given by Rokitansky and Andral, which, however, I shall not cite at length, but proceed to mention the cases which have fallen under my own observation. Case 32.—M. W., æt. 30, admitted into St. George's Hospital in a very low, almost moribund state; he had been suffering some time from cough and expectoration, with emaciation and increasing debility. He sank gradually, and died five days after admission. Post-mortem :—There were tubercles and vomicæ in both lungs; heart healthy; numerous small spots of ulceration in cœcum, several tubercles in the submucous tissue of the lower part of ileum; liver, spleen, and kidneys healthy. Stomach: the surface was quite pale; in the splenic region and the greater part of the mid, especially along the greater curvature, the mucous membrane had more or less completely disappeared, leaving the white submucous tissue exposed, with numerous black ramifying streaks coursing over it. Where the mucous membrane still remained in the softened part, it appeared as a translucent soft pulp, which even in the more affected parts formed a kind of coating to the blackened vessels. The pyloric region was not softened, nor the adjacent part of the middle, which was mammillated over a small extent. In the splenic region, microscopic examination showed only here and there some traces of the tubes in the form of wasted epithelial columns. The submucous tissue was in the same state as if it had been steeped in acetic acid, the vessels and nerves traversing it were affected in the same manner, their fibrous tissue being rendered translucent and their nuclei brought out.

with great distinctness. The blood in the vessels was converted into a deep orange pigment, which appeared black when lying in a mass. The tubes in a part of the mid region which was not dissolved were very healthy, though the blood in the vessels was converted into yellow pigment. In the pyloric region the tubes were very tolerably healthy, and there was much less change of the blood. Case 33.—C. D., æt. one year, female, was attacked at first with croupy cough and fever, with convulsions and opisthotonos, had some retching and vomiting, after five weeks' illness died, not in the way of coma. Post-mortem :—Lungs, heart, and liver healthy ; kidneys enlarged, mottled, and fatty. On opening the abdomen the stomach was found empty, as might have been expected from the circumstance that no food was taken for at least twenty-four hours before death ; its surface was quite pale, the reaction highly acid. In the splenic half the mucous membrane was reduced to a translucent pulp, and even the submucous and muscular coats were rendered much more transparent than natural. The pyloric half was unaltered ; its tubes were quite healthy, and the basement membrane of the surface was perfect. The limit between the softened and healthy parts was tolerably well defined, it might have been indicated by a line passing from the lesser curvature downwards. In the softened part the mucous membrane was not everywhere detached, but remained as an opaque whity line visible to the naked eye, which presented under the microscope débris of tubes, and scattered epithelial particles. The blood in the vessels was converted into yellow pigment. Case 34.—J. S., æt. 47, male, a great

gin-drinker, was ill for one month, during a good part of which he doctored himself. He had pericarditis and pleuritis. The left lung was found greatly congested and full of tubercles; the kidneys and liver and the heart were tolerably healthy; the pericardium was very much injected and covered with fibrine. Stomach: the cavity large, muscular coat not contracted; on removing the organ the coats gave way, and a large quantity of fluid escaped. The mucous membrane was quite destroyed in three-fourths of its extent, the pyloric region was the only part where it still remained, elsewhere the submucous tissue was quite exposed. The reaction of the surface was intensely acid. The tubes in the pyloric region were tolerably healthy, except that they were imbedded amid very abundant nucleated tissue. These three cases are the only ones out of 124, which I have examined, where an alteration of this kind has been met with. What Hunter says is quite true, "that there are very few dead bodies in which the stomach at its great end is not in some degree digested;" but this condition, which is so common, is very different from that which the above-related cases exhibited. In the common form of softening, the mucous membrane at the splenic end is found thin, for the most part dark stained by hæmatine, very slippery, so that it is difficult to make a vertical section of it, and appearing as a dark film gliding over the whitish submucous tissue. The tubes appear under the microscope a good deal altered, their outlines are tolerably distinct, but their epithelium is partly dissolved, and the whole structure shows a tendency to disintegrate. Dark grains of pigment

are sometimes deposited between the tubes. This condition may be quite safely regarded as a mere post-mortem change, and its great frequency as compared with the rarity of the other, affords good ground for the belief that there is a material difference between them. Rokitansky, admitting the close resemblance that may exist between the two forms of softening, takes as distinguishing characters of the cadaveric change, the absence of symptoms during life, the occurrence of death during digestion, and the situation of the chief effect being correspondent to that of the greatest quantity of the gastric contents. That its own secretion should digest a dead stomach cannot be any matter of surprise, as we have seen that the gastric juice retains its qualities a long time without being altered; and it is clear that when the play of vital affinities has ceased, the coats of the stomach are just as likely to yield to the solvent action of the fluid as ingesta of a like kind. When, therefore, we find a stomach full of acid fluid containing half-digested fluid in a state of softening, it is most reasonable to regard it as a simple chemical cadaveric change. But when a stomach is empty the case is not so clear. This was so in Case 31; it was positively ascertained that no fluid or other matter escaped from the stomach. If, then, the softening in this instance was produced by the chemical action of an acid fluid after death, that acid must have been contained in the secreting tubes themselves. That this was the case seems also probable from the very considerable change produced in the subjacent tissues, which appeared as if they had been saturated with a strong acid. But how can it be known that the

destruction of the secreting tubes was taking place during life? There are manifestly no symptoms that could make this certain, and all that can be done is to consider probabilities. Andral, in his *Anat. Pathol.*, p. 81, says, that "in many chronic, especially pulmonary, diseases, a period comes when the patients lose appetite, and cannot digest without difficulty." They have no other morbid symptoms, and after death the most frequent change found is a softening of the gastric mucous membrane, which may present a brown, or reddish, or milky, or simply pale, or quite natural colour. Sometimes there are marked symptoms, pain in the epigastrium, vomiting, and red tongue, and in such cases the softening of the membrane is attended with a vivid redness. Dr. Abercrombie relates a case of pulmonary phthisis in which the sense of oppression and irritation, after eating, was such that the patient gave up entirely, and of his own accord, the use of solid food. He had at one time considerable pain and tenderness in the epigastrium, which was relieved by local bleeding and counter-irritation. He had much thirst, but could not take liquids, from the uneasiness they occasioned. There was no vomiting. He died after about fifteen months of illness, extremely emaciated. At the post-mortem the lungs were found full of tubercles, but there was no suppuration. The stomach was but little injected on its inner surface, but all the upper half of the mucous coat was destroyed, while the lower remained normal. There was a distinct boundary between the two portions. Rokitsky marks general anæmia, particularly evident in the intestinal canal, and general collapse and wasting, as

constant accompaniments of the gelatinous softening which occurs in children. He observes that it often coexists with cerebral affections, and suggests that its proximate cause may be diseased innervation of the stomach. In another form, where the membrane is blackened, he speaks of it as a fatal degeneration occurring as a sequel of certain cachexiæ, produced by various severe diseases. This form, in my belief, differs from the other only in the presence of a large quantity of blood in the tissue, which becomes changed into black pigment. Dr. Copland (*Art. Stomach*, p. 920) describes the symptoms of gelatiniform softening in children, as chiefly loss of appetite, thirst, vomiting, diarrhoea, emaciation becoming extreme, somnolency and irritability. He believes "that the softening often exists to a considerable degree previously to death; but the advanced stage of disorganization, and more especially erosion and perforation, are early consequences of dissolution, which the fluids of the stomach may have been, more or less, concerned in producing." The following negative results are of some use, as showing that softening even in children, who are notoriously most liable to it, is no constant accompaniment of either wasting, or severe acute diseases. The stomach was examined carefully, and found healthy in all the following cases:—C., æt. 5, girl, dying of asthenia, at an advanced period of continued fever. L. G., æt. 5, dying with hypertrophy and valvular heart disease. P., æt. 20 months, girl, ill 5 months, dying with general tuberculosis. C. A., girl, æt. 6, dying of asthenia, after scarlet fever. F. H., boy, æt. $2\frac{3}{4}$ years, anæmic and emaciated, dying with acute double pleuritis. W., æt. 2 years, boy, dying with albuminuria from scar-

latina and head symptoms. M. E. C., æt. 4 months, girl, had inflammatory diarrhœa, colon ulcerated, ill one month. It is clear that one cannot conclude from the experience of Andral, and the case recorded by Dr. Abercrombie, that the destruction of the gastric tissue found after death, had been going on during the latter weeks or months of life, and giving rise to the anorexia and difficult or painful digestion. Andral himself, with his wonted wisdom, expresses no such opinion. He says, "during life there may have existed in the stomach such a morbid state, betrayed to us by well-marked functional disorders, as after death, reveals itself to us by softening of the stomach; this morbid state having put the stomach into such a condition that it undergoes softening after death, under the influence of causes which, without this antecedent morbid state, would have been without action, and would not have produced this effect." The following experiment performed by M. Camerer, bears very well on this point. He collected some fluid from the stomachs of children who died with softening of the organ, and introduced it into the stomach of a living rabbit. No morbid effect was produced; on the animal being killed the stomach was found to be perfectly healthy. But if the nerves of the stomach were cut, then the introduction of the fluid occasioned softening of the parietes, which again did not take place when the nerves only were divided and no fluid introduced. The section of the nerves in these experiments corresponds to Andral's preliminary morbid state.* In

* The fact that the softened tissue is intensely acid as well as those in contact with it, has scarcely been sufficiently dwelt upon by observers. This, it is clear, is a very unnatural condition to exist when the stomach is

concluding this chapter, I may put into the form of a few propositions, the amount of probable knowledge we have respecting softening of the stomach.

(1.) There are two forms of softening, one the commonest by far, which is simply the result of the action of the acid contents of the stomach upon its own dead tissue: the other, the consequence of a peculiar change taking place in its glandular structure, which generates a powerful acid on the spot, corroding and destroying itself and the tissues beneath.

(2.) The latter form may occur either with an empty or full state of the blood-vessels of the stomach, the softened part of which will accordingly be either quite pale, or of a dark blackish tint.

(3.) This same form occurs in a great variety of morbid states, which seem to have only this in common,—that they are attended with great depression of the vital power.

(4.) It is more common in children than in adults, on account of the greater delicacy and less resisting power of their systems.

(5.) The parts of the mucous membrane undestroyed, show no deviation from their healthy structure.

(IX.) *Fibroid thickening of the tissues subjacent to the mucous membrane.*—The walls of the stomach are occasionally found very considerably thickened, so as to be even $1\frac{1}{2}$ inch in diameter in some parts. In former times the thickening was supposed to

empty, and its walls quite pale, as often happens. The reaction should be neutral, but owing to some obscure cause the tubes at, or shortly before, death are goaded into extraordinary activity, producing a powerful acid, which seems to be diffused all around, rather than to be poured out on the surface. There is some resemblance between this last act of secretion and the dying muscular contraction.

depend on the presence of scirrhus, or hard cancer, but more correct views have been taken of the nature of this change in late years. Andral, who has given an excellent description of the appearances observed in his *Précis d'Anat. Path.*, remarks very justly that the only difference between common induration and this thickening is one of degree. Dr. H. Bennett, in his work on cancerous and cancrioid growths, has related three cases, Nos. XXII, XXIII, and XXIV, where the morbid change appears to have been of this nature. The coats were thickened so as to be sometimes an inch thick, of a whitish colour, tough and elastic, and presented under the microscope no structures that were at all characteristic of cancer, but such as belong to various forms of simple fibrous or sarcomatous tumour. The same may be said of two cases recorded in the Pathological Society's Report for '52-'53, at pp. 128, 129. The submucous tissue, according to Andral, seems to be the locus where fibroid thickening first shows itself, from hence it spreads as white lines through the muscular coat, and affects the subserous areolar tissue. As the thickening increases, the laminae of fibroid substance encroach more and more upon the muscular layer, which wastes and gradually disappears, until at length there is nothing to be seen between the peritoneum and the mucous membrane, but a mass of hypertrophied and indurated areolar tissue. Andral proceeds to say, that this morbid state is, in the majority of cases, the result of chronic irritation of the mucous membrane, "although none of the numerous varieties of this irritation necessarily brings with it its formation." No appreciable lesion may be found in the mucous mem-

brane, either because this lesion has long ceased to exist, or even in some cases because it never has existed. Sometimes the mucous membrane is found either simply hyperæmiated, or indurated or softened; sometimes it is ulcerated. "There are even cases where no trace of mucous membrane is found in all the parts corresponding to the hypertrophied portion of the areolar tissue." In two of Dr. Bennett's cases the mucous membrane of the stomach appeared healthy, with the exception of an ulcer in the XXIII. In the cases referred to in the Pathological Society's Report, there is no mention of any particular morbid condition of the mucous membrane; it was not ulcerated or abraded in either.* I have so very often seen all kinds of morbid changes in the gastric mucous membrane unattended with this peculiar thickening of the coats, that I cannot think the two are at all closely connected. The prominent feature which differentiates this thickening, especially when it attains a considerable amount from any result of mere inflammation, is that the new-formed substance is manifestly a growth, augmenting by assimilative power its own tissue, just as a normal tissue does. This quality does not belong to purely inflammatory exudations; whatever be their amount, their general tendency is to disintegration or decay, or to diminution in size. It is, however, quite intelligible that a frequent abnormal flux of blood taking place to an

* In the case described in the note at p. 121, where the submucous tissue was thickened considerably, the greater part of the mucous membrane was in the uttermost state of atrophy, probably from the compression exerted by the dense firm tissue upon the nutrient vessels passing through it. Had the new-formed material been more lax and bulky, the wasting of the mucous membrane might not have occurred.

adjacent texture, might call forth a tendency to fibroid thickening which would otherwise have remained latent. The chief question to be decided is, whether such thickening is to be regarded as of cancerous nature, or as more allied to cirrhosis and fibrous tumour and the like. With regard to this point, Andral, speaking from naked-eye observation, entertains no doubt as to the non-cancerousness of the condition in question. Dr. Bennett, after careful microscopic examination and consideration of the point, is of the same opinion. Dr. Quain, in his report on one of the cases presented to the Pathological Society, remarks that "the absence of stroma, of well-marked nucleated cancer cells varying in size and form, and of distinct cancer juice, leaves considerable doubt on the mind as to the morbid textures being of a truly malignant nature, however much their general character may present this appearance." Dr. Lionel Beale reports on the other case: "This tumour, I believe, consisted of white fibrous tissue, the meshes of which contained an albuminous fluid." Dr. Hare also, and Mr. Clover, after microscopic examination, found no proof of cancerous character in the altered tissue. In the only specimen I have procured, where there was any approach to the above state, I observed that there was a prodigious amount of fibroid formation taking place in the subtubular tissue and corium, which was all full of elongated and fibre-forming nuclei. As simple fibrous or sarcomatous tumours (I use the latter term to describe such tumours as contain much albuminous substance and but little fibre) may present very various appearances from the firm, dense, whity gray, wavy surface of the typical

fibrous tumour to the translucent, brawn-like, softer, red or white mottled, aspect of the so-called colloid or albuminous fibrous tumour of Rokitsansky, so I am prepared to meet with similar varieties in diffused thickenings of naturally existing tissues. One very evident point of difference between the simple fibroid thickening, which I am considering, and cancer is that the latter, as is well known, selects the pyloric region, in the great majority of cases, as its seat of development, while the former is generally diffused over the whole or greater part of the organ, and shows no especial preference for the pylorus. On the contrary, in one of Dr. Bennett's observations, a small space surrounding the pylorus was free from thickening, and was the only part that was exempt. There is nothing very distinctive in the symptoms which are produced by thickening of the walls of the stomach. The cases I have quoted, mention sinking sensations, pains at the epigastrium, sometimes constant, sometimes intermitting, for a variable period, more or less severe, not always increased by food, in one instance relieved, nausea and vomiting of clear or yellowish fluid alone or with food, in one case of brownish coffee-ground-like matter also, especially at the commencement of the illness. The discovery of a tumour, will of course be the chief means of distinguishing between conditions, where the symptoms may be supposed to depend on its presence, and the disturbance it produces, and those where they proceed from other causes. The tumour may be found in the epigastrium, either hypochondriac, or the epigastric and umbilical regions. It may be distinguished from solid tumours, as was done

skilfully by Dr. Hare in his case, by the test of percussion. He observed that "over the greater part of the resisting mass, though not over the whole of it, there was some resonance on percussion." Emaciation was marked in all Dr. Bennett's cases, and in Dr. Hare's, in the former, there was no other adequate cause to account for it.

(X.) *Cancerous disease*.—As the purpose I have in view is by no means that of producing a complete work on all the diseased conditions of the stomach, but rather of endeavouring to elucidate some points less noticed by others, I shall only state briefly some observations which I have made, relating to the state of the unaffected parts of the mucous membrane in pyloric cancer, and the structural peculiarities of the cancerous growth. Case 35.—Mrs. K., of middle age: mucous membrane of stomach of natural aspect, except for about $1\frac{1}{2}$ inch in width at the pylorus, where it was in a sloughy half-destroyed state. The muscular coat was remarkably thickened everywhere, and at the pylorus was changed into a firm whitish substance, $\frac{1}{4}$ inch thick. This consisted of a fibroid stroma, imbedding a celloid substance, which was made up of nuclear particles and granulous matter, with some rather more developed corpuscles. The celloid substance was contained in spherical or elongated loculi, bounded by fibroid tissue; it sometimes was seen in a state of fatty degeneration. The débris of the mucous membrane rested upon this cancerous mass. In the splenic and mid regions the tubes were very indistinct, and there was much nucleated intertubular formation. In the pyloric region, the lower parts the tubes were aggregated together into bunches. In

one part two large cysts were seen full of clear fluid, and lined by a vesicular epithelium, lying in the substance of the mucous membrane; kidneys were granular, splenic capsule greatly thickened. Case 36. —J. H., æt. 63: Stomach pale in its splenic region, in its mid region blackish, its pyloric third occupied by a large scirrhus growth, which had destroyed the anterior wall of the stomach, and given rise to a sloughy cavity in the opposing wall of the abdomen, as well as formed a communication with the transverse colon. A section of the cancerous mass presents a general grayish surface, with a slightly apparent striation vertical to the axis of the outlet of the stomach; it was $\frac{1}{2}$ or $\frac{3}{4}$ inch thick, and its inner surface was covered with fungous growths. In some parts, chiefly near the free surface, there are dead white spots of fatty degeneration. A margin of red congestion surrounds the growth where it passes into the mucous membrane, which it does very abruptly. The external part of the mass is paler and much more translucent than the inner, and consists purely of pale fibres running parallel together, in the direction of the above-mentioned striation, and forming bundles. There is some resemblance between these fibres and those of organic muscle; it is remarkable that their nuclei are often in a state of fatty degeneration, and appear as opaque black streaks lying in the bundles, and parallel to their course. The bundles of fibres run up, and spread out amid a cell growth, which is in great measure so disposed as to form hollow villous prominences. The particles forming the villi are often exactly identical with ordinary columnar epithelium; those which lie deeper and more in the angles

of division of the bundles are more irregular in form, but nowhere are there any large, or multiform cells. In many parts there are large glomeruli, and masses of molecular fatty matter. The glomeruli are much larger than any cells in the structure. In the splenic region the tubes are tolerably healthy, but tending to break up, and encroached upon by fibroid intertubular formation. Mid region : tubes quite gone, tissue thoroughly infiltrated with nuclei and granular matter, and here and there with fatty ; there are even several groups of fat cells in different parts of the mucous tissue, and not at a great depth from the surface. The basement line was not lost. The muscular coat was hypertrophied, not the submucous. The kidneys were of the natural size, but contained numerous large cysts, and many microscopic ; more of the latter in the medullary cones, than in the cortical structure. The tubes in the latter were very much broken up, and the matrix appeared thickened. Other organs were healthy. Case 37.—J. P., æt. 50 : Stomach contracted, reaction alkaline ; the walls of the pylorus, and for two or three inches towards the cardia, were thickened by cancerous infiltration, which had a whity gray colour, and presented a defined edge. At one part near its edge, there were some small isolated masses situated in the deeper layer of the mucous membrane ; these varied from the size of a pin's head to that of a middling seed. The seat of the cancerous infiltration was the submucous tissue. The muscular coat was hypertrophied, but not greatly, it was chiefly so in the vicinity of the pylorus ; here the outlet was rather narrowed, but a goose quill could easily pass through it. There was a ragged, sloughy

cavity situated just below the pylorus, and advancing to the right much beyond it; this was produced by ulceration and sloughing of the stomach wall. The mucous membrane of the stomach was of tolerably natural aspect, the submucous vessels injected, the surface pale; it could be traced over the surface of the cancer which infiltrated it, and left it as a mere varnish to its own mass. The cancer consisted of a sparing quantity of stromal fibre, with very abundant cell substance, made up of ordinary nuclei, small nucleated cell particles, abundant granular stuff, and some granular globules. The cancerous nodules of the mucous membrane did not involve the submucous tissue, they exhibited cancerous cell growth infiltrating the mucous membrane. The tubes in the splenic region were much atrophied, the basement membrane of the surface was present, the tissue beneath was infiltrated with abundant nuclear deposit; mid region was in the same state. There were very numerous enlarged glands along the lesser curvature, which, on being cut into, had much the aspect of encephaloid, and yielded plenty of milky juice. This fluid was found to consist of small-sized cell particles provided with ordinary nuclei, and of very numerous particles closely resembling those of columnar epithelium. There were several masses of cancer in the liver, the other organs were healthy. Case 38.—Mrs. R., æt. 56: The stomach was of about the ordinary size, firmly adherent to the liver in the vicinity of the gall bladder, and to the transverse colon. Between this latter viscus and the back part of the stomach, near the pylorus, there was a ragged sloughy cavity, containing offensive chocolate fluid, and communi-

cating with the cavity of the stomach. When the latter was laid open it appeared tolerably natural in the splenic region, and in the lower part of the mid region along the greater curvature, but all the pyloric region and much of the upper part of the mid region was occupied by a whitish mass, resembling firm encephaloid. Beyond the edge of the growth there were groups of islets of similar substance, situate in the mucous membrane. An immense solid mass of firm encephaloid lay along the lesser curvature, extending almost to the cardiac orifice. In the splenic and lower part of the mid region, the structure of the mucous membrane was found to be healthy; but about the lesser curvature, where it lay in relation with the great encephaloid mass, there was very little to be seen of the tubes; the tissue was thoroughly infiltrated with granular matter, and seemed to be tending to break down into a detritus. A vertical section, carried through the diseased pyloric into the healthy mid region, showed the muscular coat greatly thickened, and not involved, except at the focus of disease in the pyloric region, where it was destroyed by ulceration. The infiltrated mucous membrane was found, by microscopic examination, to be thoroughly pervaded by granular and oily matter, mingled with celloid substance; some traces of the tubes still remained, and cylindrical strands of epithelial matter started out on pressure from the free surface, where there still remained some traces of basement membrane. The celloid infiltrating growth consisted of ordinary nuclei, oval or elongated, and of various-sized cell particles, sometimes containing nuclei, more often appearing as simple granulous corpuscles. The sub-

mucous tissue beneath this part contained numerous granulous globules, small and large, many granulous nucleated cells, whose nuclei were very like those of natural structures, and other cells where the nuclei were greatly expanded, and manifestly diverse from any natural formation. More than one nucleus might be observed in a single cell. The large white mass lying along the lesser curvature, presented a grayish whity surface; under the microscope, it appeared as a mass having no definite arrangement, and made up of a vast quantity of granular and oily matter, with a moderate number of free, feebly formed, nuclei and largish granular globules; there was nothing to be seen diagnostic of cancer. The liver, kidneys, and intestines were healthy.

In none of these cases did the cancerous growth itself consist of cells or corpuscles, that could have been declared positively to have belonged to a malignant tumour. The nuclei and cell particles were such as might have been seen in normal tissues or simple sarcomatous and similar growths. In the last case only, there were cells in the submucous tissue which differed decidedly from normal formations. The diseased glands along the lesser curvature, in this same case, contained only cells or nuclei of ordinary appearance. In the second case, the morbid growth might have been called villous, from the peculiar shape and arrangement of its cells, which formed hollow coverings, very much like the caps of the intestinal villi, and like them made up of columnar particles. It would have puzzled, I suspect, the most confiding observer in microscopic analysis to have detected the true nature of the growth, from its minute structural characters. It could scarcely be said to differ essen-

tially from a warty vegetation on the skin, in the analogy of its structure, and yet it behaved like a true cancer in respect of its destructive local action, and effect on the general system. Neither Rokitansky, in his *Pathological Anatomy*, nor Mr. Paget, in his lectures, describes villous cancer as having a covering of columnar particles, such as existed in my case, and in the one figured and described by Mr. Birkett, Report of the Path. Soc. for '52-'53. It is, of course, most probable that this would only occur on surfaces where the normal epithelium affected this shape. The occurrence of particles very much like those of columnar epithelium in the diseased lymphatic glands, in the third case, seems to be a phenomenon of the same kind as that mentioned by Mr. Paget, and which I have myself observed, viz., the formation of epithelial scaly particles in the absorbent glands adjoining the seat of disease. Mr. Paget has also observed the repetition of the epithelial form of the elementary particles in situations where there was no possibility of direct transference, as in the lungs when the original disease was in the penis, and the heart when the primary epithelial cancer was in the vicinity of and involved the eye. These facts, as well as several others, seem to me strongly to intimate the little value that can be attached to any structural character in considering the essential nature of cancerous disease. That which we can see is the least important, the invisible dynamic qualities are those which should chiefly engage our attention as sound pathological inquirers. Not much tendency was shown, in any of the above cases, to that fortunate kind of change which Rokitansky terms saponification, and which is simply fatty degeneration of the cancerous growth. It was

more manifest in the first case, than in any of the others. Some time ago, I examined a cancerous tumour of the ribs, from a man who died with encephaloid of the glands in the posterior mediastinum: the cut surface exhibited a ground almost entirely occupied with dead white patches, leaving only small intervals, in which a grayish substance was apparent. The latter was unaltered cancerous growth, the white patches were in a complete state of fatty degeneration. Perhaps we may be able some day to promote this favourable metamorphosis, following the indication held out to us by nature. In the three latter cases, sloughing or ulceration of the morbid growth had taken place to such an extent, that large cavities were formed, in the second case opening on the surface of the abdomen, and also into the transverse colon. The muscular coat was thickened, more or less, in all the cases, although there was no complete obstruction in any of the pylorus. In the last case, the remaining part of the mucous membrane was healthy, the tubes undestroyed; in the second and third they were extensively atrophied; in the first they were somewhat affected, but not much. In the two latter cases, especially, the submucous tissue appeared to be the original seat of the cancerous formation, the mucous membrane becoming involved by infiltration. This, however, took place readily, and there did not seem to be, as Dr. Walshe states, any notable resistance displayed to the encroachment of the disease. So far from this being the case, these were small separate masses of cancer developed in the mucous membrane a little beyond the edge of the infiltrating growth.

CHAPTER IV.

CLINICAL OBSERVATIONS.

THE various pathological states reviewed in the preceding chapter may be classed under the following heads :—(1.) Those in which hyperæmia or inflammation is the most prominent feature. (2.) Those in which the secretion is more or less manifestly morbid. (3.) Those in which there take place chronic textural changes of a wasting character. (4.) Ulcerations. It is manifest that post-mortem examination can give no adequate information respecting the great majority of the functional derangements ; it cannot tell us how far, and in what respect exactly, the gastric juice has been unhealthy, or what has acted as a cause of irritation to the organ, whether it be residua of digestion, or the digestive fluid itself. Clinical observation, aided by skilful chemistry, can alone judge correctly of most functional disorders. There is, however, a special and almost insuperable difficulty to chemical investigation of the digestive fluid, in cases of disease, viz., that it can scarce ever be obtained unmingled with ingesta, so that it is not possible to determine what are its constituents when first secreted. In this respect, there is a great difference between the renal and the gastric product. Some few results are, however, obtainable by superficial examination, which are not without value. It is also manifest that morbid changes of a

slighter kind, chiefly affecting the columnar epithelium of the surface, will scarcely be capable of being recognized at the time, after death, when examination is generally made. The erythematous and aphthous patches, which Dr. Beaumont was able to see in St. Martin's stomach during life, would leave little trace of their existence 18 or 24 hours after death, when the columnar epithelium had all fallen off. As clinical observers, it is, of course, in the highest degree necessary to be aware of the existence and frequency of the slighter degrees of morbid change, which may often excite much more uneasiness and distress than graver and deep-seated changes of a chronic kind, and consequently become far more commonly the objects of treatment. From the analogy of other mucous membranes, and from actual experience, there is ample proof that catarrhal disorder of the gastric mucous surface is the most common pathological condition which is met with. In its early stage, and in its exacerbations, it constitutes a large proportion of the cases which fall under class 1. In its later and less active stages it swells the number of class 2. It appears to have for its opposite the common condition of nuclear interstitial formation, which proceeds so latently. Its exciting causes will be all such as in any way irritate the mucous membrane, whether this effect be produced by indigestible food, stimulants in excess, the atmospheric poison of catarrh, or that of syphilis or rheumatism. Passive congestion and atony of the vessels are the most powerful predisposing. Its anatomical signs may be recapitulated as congestion of the vessels, primarily and principally of the larger capillaries of the surface; the secretion of viscid

mucus in varying quantity ; and diminution or arrest of the healthy acid secretion. Blood may exude in greater or less amount from the distended vessels, and give a black colour to the matters vomited. *Sarcinæ* may form in the mucus which covers the surface, and may lie there without producing any symptoms. The unhealthy mucus may be more or less watery ; sometimes it is so much so that the viscid character is almost entirely lost. Its quantity is then increased, and it is often discharged in large gushes from the mouth. This flux, so analogous to that which often takes place from the bronchi, or from the Schneiderian membrane, is the principal symptom of the disease called pyrosis, or, popularly, “waterbrash.” The most important fact to remember respecting it is that, like bronchorrhœa, it is scarcely ever attended with pyrexia, or any local inflammatory movement. It is a half-passive, half-active flux, to restrain which astringents may be freely given without fear. In the acute period of catarrh there is tenderness at the epigastrium, pain referred to the lower part of the sternum, the left side, or between the shoulders. This pain is increased by taking food, sometimes very notably by hot things more than by cold. In the later period of catarrh, when the hyperæmia has subsided, the pain is more of an aching kind, or a low, sinking feeling, or a sense of uneasiness. Neuralgic pains, dependent on gastric irritation, may be felt in the head and other parts. The irritability of the stomach is not unfrequently so great, that no relief from pain can be obtained until the food is rejected by vomiting. In some cases marked by a red, too clean condition of the tongue, which looks as if denuded of its epithelium, the

gastric surface appears to be morbidly sensitive. It is irritated by the least thing, and the digestive power is very imperfect. Still, the result of treatment indicates that there exists rather a disordered condition of the nerves of the stomach than any considerable degree of inflammation. There is, probably, at the same time, a persistent erythematous state of the mucous surface, which does not become covered with the layer of mucus, by the exudation of which hyperæmia usually relieves itself. This morbid condition is very difficult of complete cure; it has appeared to me to be especially connected with the nervous temperament. It is not, however, to be regarded as neuralgia of the stomach. Cases of inflammation of the conjunctiva, such as those described by Mr. Tyrrell, p. 29—34, vol. i. of his work, are probably of an analogous kind. Flatulence, to some extent, is of common occurrence in catarrhal affections of the stomach, but it does not occur in the extreme degree that it does in more purely neurotic conditions. The bowels are often confined in cases of gastric catarrh, but I have observed, in several cases where the irritative condition just described has been well marked, that they acted regularly, and that constipation was not produced by the daily administration of opiates. There is nothing characteristic in the urine of gastric catarrh; it is sometimes high-coloured; but this seems to be only part of a general febrile movement, and passes away with it. The catamenial discharge is often irregular in females, or there may be amenorrhœa. The tongue has not appeared to me to afford any absolutely certain indication of the state of the stomach, not even in the case just mentioned, where irrita-

bility is the prominent feature. I doubt exceedingly the correctness of Andral's statement, that the appearance of red injected papillæ at the apex "is always in the direct ratio of the intensity of the gastric irritation." The sensation of thirst varies. I have not often found it very marked, at least in cases which have lasted some time. A sense of "inward fever" is sometimes complained of, evidently referred to the stomach, or a "burning pain," or "a hotness." The state of the appetite varies; where there is much pain after taking food it is rather deficient, and very much so when the membrane may be presumed to be in a relaxed atonic state, incapable of pouring out healthy gastric juice. In other cases, where a state of irritation predominates over atony, there is a constant feeling of craving for food, which seems, as the sufferers say, to do no good. The sensation is a false and delusive one, and if yielded to aggravates the morbid condition. It cannot be appeased by fresh excitation, but is to be met by sedatives. The association of gastric with bronchial catarrh is very frequent, and one very common cause of relapse is "having taken a fresh cold." The matters vomited in gastric catarrh will, of course, vary according to the pathological condition of the organ, and the kind of food (if any) that has been taken. If the vomit consist chiefly of ingesta, mingled with a non-tenacious acid fluid in moderate quantity, not fermenting, and not containing sarcinæ, the case is probably one rather of irritability of the organ, than of catarrh. In acute catarrh the vomit is acid, and contains a good deal of tenacious mucus, together with watery fluid. When there has been much hyperæmia, the fluid may be of a brownish tint, and

show, under the microscope, remains of blood globules or masses of orange pigment. The tenacious mucous plasma often presents the appearance of fibres, just as mucus from other parts does, when treated with acetic acid. Numerous nuclei from the cells of the tubes are seen imbedded in it, and sometimes even the cells themselves, more or less altered. Composite nuclei, in large masses, are sometimes present, exactly resembling those of pus or mucous corpuscles, and I have in one case been able to restore the original corpuscles by adding solution of carb. of soda. I do not, however, think that these corpuscles are formed in the stomach. I rather believe them to proceed from the pharyngeal follicles, and to be mingled with the gastric fluid, just as epithelial scales from the mouth or œsophagus often are. Neutral or alkaline watery, colourless vomit, if habitual or frequent, is indicative, I believe, of a chronic catarrhal state, with, not improbably, a degenerated condition of the mucous membrane, or considerable depression of the general power of the system. Sarcinæ are not unfrequently found in the vomit of chronic gastric catarrh; but the fluid has not the peculiar frothy, fermenting appearance, and there are no special symptoms. .

When stomach catarrh is attended with much irritability of the mucous membrane, the mental condition is evidently affected. The irritation conveyed to the brain by the pneumogastric betrays itself by an anxious, morose, petulant, or fearful temper, which may often aid the observer in appreciating aright the morbid state. On the other hand, the influence of mental conditions upon the stomach is very great, and may be an insuperable cause of disorder.

The foregoing remarks are only intended as an outline of the symptoms generally observed in the varieties of gastric catarrh. To enter more into detail would be not to the purpose I have in view, and has been done completely by others. What I wish to do is, to present a somewhat clearer and simpler view of a very varying and sometimes puzzling complex of symptoms, by contemplating them with reference to known pathological states. I wish the reader to think not so much of dyspepsia, whether atonic, inflammatory, or irritative, but of a state of the mucous membrane conveniently expressed under the term catarrh, and passing through all the stages and presenting all the varieties which it does in other situations. A little reflection on a common nasal catarrh will help us a good deal to understand the varying phenomena of gastric catarrh. From these general observations I now proceed to the detail of some cases which may serve to illustrate the treatment of gastric catarrh, and its etiology, as well as that of some allied conditions. The histories are briefer than I could wish, but, as the patients were, for the most part, externs at St. Mary's Hospital, I had not sufficient time to take complete notes.

Case 39.—R. B., æt. 18, wire weaver, male, single, admitted Jan. 30th : looks pale, of thin habit, not tall ; ill 1 week with loss of appetite ; some epigastric uneasiness ; pain in head, and shivering sensations. His food lies heavy at his stomach after taking it ; the tongue is red, has a thin white indusium, and some prominent papillæ ; he feels very thirsty ; pulse, rather frequent ; skin, cool ; bowels, relaxed. I gave him Hydr. c. Cretâ gr. ifs., Pulv. Doveri gr. iij., *ter die* for

3 days, and Mist. Ammon Acet. $\mathfrak{z}\text{i}$., c. Acid. Hydrocy. Dil. m. iv., *4tis horis*. Feb. 6th: the bowels were much relaxed, the skin was rather hot; the tongue as before. Finding the catarrhal affection was passing into actual diarrhœa, I gave him Pulv. Cretæ Co. c. Opio gr. x. *quater die*, and Haust. Salin. $\mathfrak{z}\text{i}$., Magnes. gr. v., Tr. Opii. m. iij., *quater die*; desiring him, I think, to continue only the mixture when the diarrhœa was stopped. Feb. 13: he had had cough and sore throat, there were moist râles all through both lungs; skin, cool; uvula, relaxed; breathing, quick. I now gave him Mist. Oxymel. Scill. $\mathfrak{z}\text{ss}$. c. Vin. Ipecac. m. xv., *4tis horis*, and put a blister between his shoulders. 20th: he was a great deal better, but very weak, much less cough, tongue almost natural. He then took Ol. Morr. $\mathfrak{z}\text{ss}$., *ter die*, and Acid. Muriat. m. ij., Tr. Aurant. m. xxv., Aquæ $\mathfrak{z}\text{ss}$., *ter die* for 14 days, at the end of which time he had gained strength, said he had nothing to complain of, and was very near quite well. Here was a simple case of catarrh affecting primarily the gastric and intestinal mucous surface, and afterwards the pulmonary. After it subsided, recovery was speedy under a gentle tonic and analeptic treatment. The acid was especially given with the view of assisting digestion.

Case 40.—G. W., æt. 31, a painter, dark hair, intelligent; admitted Oct. 16th: ill 2 months, tongue clean, skin cool, pulse weak, bowels act quickly after food, are open 3 or 4 times a-day, abdomen large, appetite not good, much thirst. “Directly he eats there is only wind and water.” Brings up cold water from the stomach, mostly in the evening, the vomiting being preceded by pain in the abdomen; emaciating; has cough, and frothy and yellow expectoration; hæmop-

tysis has only occurred in streaks ; nothing decidedly morbid discovered by auscultation in chest. None of his family phthisical. No blue line on gums.

℞ Hydr. c. Cretâ gr. ifs.

Pulv. Doveri gr. v., *ter die*.

℞ Mist. Mucilag. ʒi., Sodæ Carb. gr. v.

Acidi Hydrocy. Dil. m. iv., Liq. Opii. Sed.
m. iij., *ter die*.

19th : Is quite a new man altogether ; feels able to go and do a good day's work ; has less flatulence ; expectoration not yellow, only a little blackish ; bowels, open once a day ; tongue, natural ; skin, cold ; pulse, weak.

Pt. in pulv. o. n. Pt. in mist.

23rd : Gets on nicely ; is better than he has been for 2 years ; could never eat comfortably, always felt sick after. Can now eat better, takes boiled mutton without any subsequent uneasiness ; enjoys all his meals, and they seem to do him good ; can draw his breath better, and sigh and laugh ; tongue rather whitish ; has some pain in head, and some pricking pain in chest and sides of chest. I now prescribed for him a mixture containing Muriatic and Hydrocyanic acid, in Inf. Gent. Co., but this brought on a return of pain, and on Oct. 30th was exchanged for the former treatment, which had agreed so well, the powder being taken at night only. He continued this only a short time, but when I saw him on December 13th, he reported that he had returned to work and continued at it for about 6 weeks ; he had no sickness or uneasiness after eating, and was gaining flesh. His bowels acted properly, without lientery. Says

“he is a new man, and better than he has been for 4 or 5 years.” He still has indications of catarrh lingering about him, in “his nose running much while he is at work.”

In this case there existed gastro-intestinal, and bronchial catarrh, the former manifesting itself chiefly by irritability of the muscular coat of the stomach and bowels, and by watery and gaseous profluvium from the gastric mucous surface. I should not suppose that there was any accumulation of tenacious mucus. The effect of sedative and alterative treatment was rapidly beneficial: but acid tonics, though combined with a sedative, were not borne, an occurrence which I think is not uncommon in patients of the nervo-sanguineous temperament. Their systems having no deficiency of tone, regain their equilibrium readily when once the state of irritation is removed. It is curious to observe the indications of more free action of the diaphragm, as the stomach became more quiet, and less distended.

Case 41.—S. S., æt. 53, female, married, admitted March 13th. She had been ill 6 days, was first attacked with vomiting of watery fluid. She said that she had pain and sinking at the epigastrium, and pain across the loins. The pain was worse, and she felt sick after food; bowels, open; tongue, whitish, moist; pulse of good force. She took an Ipecacuan emetic that night, and afterwards a pill of Tannic acid and Henbane, with m. v. of Hydrocyanic acid, gr. vij. of Nitre in Camphor water, three times a day. 20th: she had lost the feeling of sickness, but had pains across the abdomen and loins, and front of chest. Supposing these to be of rheumatic nature, I then prescribed Iodide of Potas-

sium, with Liq. Potass. and Hydrocyanic acid, in a bitter, and continued the Tannic acid and Henbane, but with no good effect. On the 3rd of April, when I saw her next, she was worse; I then gave gr. iij. of Calomel every other night, and an aperient draught of Magnesia and Sulph. of Magnes. twice a-day: under this treatment she improved; was much better on the 10th, but not quite free from pain. She then continued the calomel twice a-week only, and took the draught every morning, and in another fortnight she had quite recovered. This was a case of recent catarrh affecting only the stomach: astringents and sedatives relieved the sickness, but not the pain. The hyperæmia of the mucous membrane probably continued. By moderate purging, however, the vessels were unloaded, and the tissue returned to a healthy state.

Case 41.—M. C., æt. 35, wife of a plumber, admitted June 5th. Has had rheumatism previously. Ill now some weeks. Suffers with pain across forehead; when the pain leaves her head it affects her limbs. Has very little rest at night from cough, which is dry. Is enceinte. Bowels, costive. Pulse, weak. Skin, warm. Tongue, white, and coated at back. Has “inward fever,” and bad digestion. Her stomach aches after meals, particularly if she takes anything heavy. Directing my attention to the rheumatism first, I gave her Iod. Potass., and Soda in Infus. Gentian., with an emetic that night, and a daily laxative of blue pill and colocynth. She benefited under this, but the next week the cough was still troublesome, and there were some wheezing râles in the trachea; so I applied a large blister between the scapulæ, and added Vin. Ipecac., Oxymel. Scill., and Liq. Opii. Sed. to the mixture.

On the 29th the cough was very much better, but the digestion was weak, and she complained of a sense of aching in the stomach after meals. I then continued the mixture, omitting only the Opium, and gave her in addition a pill of Quinine, Tannic acid, and Henbane, to take thrice daily. She went on improving on this plan till July the 17th, when she said her cough was gone, but she had some flying pains in her limbs. To meet these I gave her Muriate of Ammonia, and Vin. Colch. in Dec. Cinchon.; still continuing the pill; and in ten days more she was discharged very fairly well, her digestion being quite natural. Here was a combination of chronic rheumatism, with bronchial and gastric catarrh. It does not appear, however, that the former was a special excitant of the other affections. It is interesting to observe how the two suffering organs, evidently under the same disorder, express their distresses each by its own symptoms. The bronchial catarrh had its cough, its râles, and later its expectoration. The gastric, its aching, uneasiness, bad digestion, and inward fever.

Case 42.—A. S., æt. 48, wife of a stoker in gas works; a healthy-looking Scotchwoman, admitted January 16th. Has been ill two or three weeks this time, but has suffered in a similar way before. Has pains in abdomen, and a sense of weakness in the left side. Her food digests badly; she vomits up everything that she eats in about a quarter of an hour after swallowing it. Tongue, pretty clean. Bowels, always costive. Cat., ceasing. Urine, turbid. Pulse, quiet. Is very restless at night. She states that attacks of this kind always come on in the winter, when she loses flesh, but gets stout again in the summer. She

took Pulv. Kino Co. gr. xv. c. Pulv. Rhei gr. iv., *ter die*, and an Ipecacuan emetic every other night; the object proposed being to evacuate unhealthy mucus, and to astringe and soothe the relaxed and congested membrane. February 2nd: she reported that she did not vomit up her food, but often felt sick; she had not so much pain in the chest. She continued the same plan ten days longer. Then she stated that she had no sickness, but felt pain and weakness across the stomach; her food lay heavy. Bowels, costive. I put a large warm plaster over the epigastrium, and ordered her Arg. Nitrat. gr. fs., Acid. Tannic. gr. iij., Extr. Hyoscy. gr. i., *ter die*, and to take ʒss. of Liq. Pepsin. with each of her three daily meals. The Liq. Pepsin. was an infusion of the mucous membrane of the pig's stomach, containing m. v. of strong muriatic acid to the ʒss. of water. February 20th: she was a great deal better, taking food better, had no sickness, no pain in side; "the plaster kept her nice and firm." She continued this treatment till April 6th, when she reported that she was quite well as regarded her stomach, only feeling rather weak. This was a rather severe case of gastric catarrh; there was no active inflammation present, but a good deal of irritability of the mucous membrane. A perfect cure was accomplished by sedatives and astringents, with the aid of a peptic tonic to assist the weak organ in its labour.

Case 43.—M. A. W., æt. 17, female, single, admitted April 13th. Ill more than a year. Has pain in the lower part of chest, in left side and back, worse after eating. Has no ease after taking food (even light) until she vomits it up again; this has been the case for six weeks. Tongue, denuded, moist. Pulse,

weak. Skin, not hot. Is very thirsty. Urine, very high-coloured. Cat., absent five months. Is always worse when exerting herself. I prescribed gr. v. of Gray and Dover's powders (each), and m. v. of Acid. Hydrocy. Dil. in ζ i. of Haust. Salin., thrice daily, and desired her to take for her food nothing but milk cooled by a lump of ice in it, with crumbs of stale bread. On the 15th she reported that she had not taken much beside the iced milk, but that she had not been sick since. Mouth, not sore. Skin, cool. Urine, not so red. Bowels, open. Pulse, very weak. I directed her then to continue the powder every night, and the mixture as before, and to apply a mildly counter-irritant plaster to the epigastrium. On the 20th she stated that she had tried fish, but had brought it up again; but had been able to take a chop and ground rice pudding without sickness. She was less thirsty. I discontinued the mercurial, and gave her instead the following pill thrice daily: Acid. Tannici gr. iij., Argenti Nitratis gr. $\frac{1}{3}$., Extr. Opii gr. fs. She continued the mixture. May 4th: she had had no return of sickness, had some uneasiness at the epigastrium and in the loins; she found a chop or piece of beef and potatoes agree tolerably well with her stomach, but not fish, or green vegetables. I let her go on in the same way, as she was a housemaid, and it would have been very difficult to have attempted to regulate her diet exactly, and as she was improving. May 18th: I saw her for the last time; she then reported that she was much better, but not very strong. The tongue remained denuded and moist. Bowels, open. I gave the mercurial at the commencement of the treatment, with the view of assisting to reduce the

local erythematous action which I believed to exist. In catarrhal affections of the intestine, practitioners well know how effectual the above combination often is, and I think it was of some use here, though, of course, the abstinence and the hydrocyanic acid were also adjuvants. The astringents and sedatives afterwards gave tone to the mucous membrane, and kept down irritation. It is worthy of remark, that gr. iſs. of opium in the day did not confine the bowels.

Case 44.—Mary M., æt. 39, wife of a labourer, admitted September 15th. She stated that she had been ill for thirteen years, was much emaciated, had pain in her chest, back, and left side. She brought up a watery fluid from her stomach, and also vomited her food. She said her bowels were confined, in answer to the usual inquiry, and remarked that she could not “have much to pass, as she throws everything off.” She had much flatulence. Tongue, dryish. A dreadful sinking at the epigastrium. Catamenia, not regular. Urine pale, and at times thick. Blisters had been applied without relief. I gave her Bismuthi Trisnitr. gr. x., Magnes. gr. iij., Acid. Hydrocy. Dil. m. v., Mist. Mucil. ʒi., *ter die*; and Arg. Nitrat. gr. ſs., Camphor. gr. iv., Extr. Hyoscyam. gr. ij., Aloes, gr. i., *ter die*. September 29th: she was much better, had had no sickness for eight days; pain in the chest came on, she said, at the turn of the day, which was relieved by a dose of the medicine. October 6th: “Not so well for thirteen years as last three weeks.” 13th: “Pain only comes on the days that she has washing to do; wringing of the clothes causes it.” She went on with the same treatment, only that the Bismuth was increased to gr. xv., and the Magnes. to gr. vi.,

and she took Ol. Morr. ʒij. *bis die*. She went on very well up to November 24th, remarking on 17th, "the cold flies to her chest (stomach, for she had no pulmonary symptoms), I must keep out of the cold." At the above date she stated that she "kept nicely," but was afraid to leave off medicine for fear of a relapse. Her food digested well. The tongue was natural: she said it became parched at night, but she was not thirsty *downwards*. Soon after this she relapsed, and ceased to attend. This was an inveterate case of gastric catarrh; the effect of cold in exciting it was quite as apparent as if it had been bronchial. The benefit derived from treatment was very marked, but it would have required a long perseverance in the same plan, and, probably, more favourable circumstances than could be commanded, to have obtained a perfect cure. The effect of exertion (too probably, over-exertion) as a laundress, was very manifest in inducing a return of the pain and other symptoms. This cause is, beyond doubt, one of the most efficient in inducing the dyspepsias of the poor, very far more, I believe, than over-eating. Could they do, as Andral says some of his patients did, take their meals in bed, and stay there all the time that digestion is going on, they would suffer far less from disorders of the stomach than they do. It is not, however, only bodily exertion that impedes digestion; severe mental effort will do the same, and should always be forborne by those whose stomach is at all weak after a full meal. On the other hand, recreation and mental repose, in short, whatever increases the general power, materially assist the digestive process; and on these grounds I am sure that the often-abused practice of

dining late has much to recommend it. Cheerful conversation, the consciousness of work done, and the presence of friendly faces, will make a meal not only far more pleasant, but far more wholesome, than early hours and solitude. The remark, that "she was not thirsty downwards" (I need not apologize for quoting graphic if less elegant phrases), compared with the complaint of "inward fever," indicates clearly the share which the stomach has in the sensation of thirst, and how this may depend on an inflammatory state of the gastric mucous surface.

The following cases I quote as more particularly illustrative of the phenomena and treatment of that condition of the stomach already referred to, in which a morbid sensibility, combined with more or less hyperæmia, predominates over unhealthy secretion:—

Case 45.—Ann P., æt. 24, single; admitted December 12th. Of large make, pallid. Amenorrhœa, 3 months. Ill 14 days. Has pain in chest and left side; any food that she takes, except gruel, causes pain until it returns. Tongue, rather denuded. Pain does not seem aggravated by pressure. To take Liq. Opii Sed. m. iv., Acid. Hydrocy. Dil. m. v., Mist. Camph. ʒss., *quater die*. 15th: side much better. Bowels, open. 19th: pain is gone. Cat. have appeared, but pale and scanty. To take Liq. Opii. Sed. m. iv., Acidi Nitrici m. iij., Inf. Cascarill. ʒi., *ter die*. 29th: can eat anything; did not, however, feel quite comfortable after *goose*. Bowels, open. Pt. in Mist. c. Tr. Cinchon. ʒi., *ter die*. January 9th: feels rather weak in left side, but is very much better than she was the last time. Can eat anything. Tongue, still rather denuded, moist. Feels well

enough to be discharged. The good effects of sedatives alone at the commencement, and of a sedative combined with tonics afterwards, are very manifest in this case. I think the administration of the sedatives in a small quantity of vehicle is important while the stomach is irritable; the local effect is thereby rendered greater, and there is less fear of offending the sensitive organ by a too great bulk.

Case 46.—Mary P., æt. 43, single, domestic servant, admitted December 15th. Of highly-nervous, *spirituel* aspect, a perfect specimen of a would-be fine lady. She stated that she was usually poorly and delicate, and had had amenorrhœa 2 years. She was ill 1 week. Had at first a *violent cold* and severe pains in limbs. Has pain at chest, made worse by food: “a cup of arrow-root set her screaming last night.” Has a dry, hacking cough. No tenderness at epigastrium, but the pain is made worse by moving. Tongue, dryish. Bowels, confined. Pulse, very weak. Always sleeps badly. I gave her Argenti Nitrat. gr. fs., Extr. Hyoscy. gr. ij., *ter die*; and Acid. Hydrocy. Dil. m. iv., Liq. Opii Sed. m. iij., ex Mist. Camph. ʒfs., *quater die*. She was to take for her diet chiefly iced milk and stale crumb of bread. 22nd: she reported herself quite a different person: her appetite had all come back; she had no pains, only felt hungry. Bowels, open. She declared that after the first pill and draught she had a better night’s rest than she had had for some months. She continued the same treatment till January 9th, when she stated that she had been able to take meat every day, and to do her work. On the 7th, she got some return of cough and pain of a different kind. She says she is apt to have catarrh in the winter.

I continued the pill, and gave her Acid. Nitric. m. iij., Liq. Opii Sed. m. iv., Inf. Gent. Co. ʒi., *ter die*; under which she went on very fairly for 14 days, and then thought herself well enough to be discharged.

The catarrhal origin of this attack was very clear, as well as the hyperæsthesia. From the mental character of the patient, I feared she would have been a very unsatisfactory one. There was, however, actual bodily disorder, which the remedies suited well. Had blistering or leeching been resorted to, it is pretty certain the result would have been less favourable.

Case 47.—Elizabeth W., æt. 18, single, admitted November 27th. She is rather pallid, with a patch of florid redness on cheeks. Of superior bearing and manners. Not hysterical. Her home has been made unhappy by differences between her parents, and she is now at a distance with relatives. She has been ill off and on 3 or 4 years. Her food lies heavy at the stomach, causing intense pain. Tongue, pale and dryish, giving the idea of an irritated condition of the associated mucous surface. Catamenia, sometimes too copious, at others deficient. Bowels, costive. Pulse, of moderate force. I gave her Argenti Nitrat. gr. fs., Camphor. gr. i., Extr. Hyoscy. gr. ij., *ter die*; and Acid. Hydrocy. Dil. m. v., Sod. Carb. gr. v., ex Mist. Camph. ʒfs., *ter die*. She improved on this very much, so that, December 8th, she reported that she could eat a mutton-chop very well, and take sago-pudding, &c. Tongue still appeared irritable. I continued the medicines, and wished her to try, besides, Ol. Morr. ʒij., *bis die*, with the meals. December 19th: she reported that she could not take the oil. She had got a bad cold and return of the pain at her chest. Under Tan-

nic acid and Henbane, with Hydrocyanic acid and Liq. Opii Sed., she went on again improving until February 16th, when I substituted Acid. Muriat. m. iij. ex Aquæ ʒss., to be taken with the meals thrice daily, for the sedative. This acid did not agree, and when I saw her again, on March 2nd, she was complaining of fresh catarrh. Although I recurred to the sedative, and continued the pill of tannic acid and henbane, she got worse, and on March 16th stated that she was sick after every thing. I then gave her Argenti Nitrat. gr. fs. with the Tannic acid, and continued the sedative draught. Four days later the sickness continued, and she had much pain at the stomach. A blister was now applied, but the next week she stated all the symptoms were worse; she had been taking only very light food, chiefly iced milk, I think, but now she found that boiled rice was the only thing the stomach would retain. I then prescribed Bismuthi Trisnit. gr. x., Magnes. gr. viij., Sod. Carb. gr. x., Acid. Hydrocy. Dil. m. iv., Aquæ ʒi., *quater die*. In 3 days the stomach was much quieter, there was no more sickness; she found speedy relief from the medicine. Tongue was smooth and red. She said that she dreamed much at night. Pt. Extr. Hyoscy. gr. v., *o. n.* April 13th: not quite so well last 2 days; has much pain in left side, extending to the back. Pulse, rather frequent, skin warm. Tongue, as before. Believing now that I had to deal with a persistent erythematous condition of the gastric mucous membrane, I determined to try mild mercurial treatment, and gave her Hydr. Chloridi gr. i., Opii gr. fs., *ter die*., pt. in mist. 17th: she was better. 27th: improving; mouth not sore; can take meat. She has not had medicine the last 5

days, and has not been so well without it. May 4th : tongue certainly less red, and more inclined to be covered by epithelium ; mouth not sore ; takes stewed mutton well ; has pain in the left side occasionally. Bowels, open. Pt. in pil. *bis die*, et in mist ; Empl. Picis amplum c. Camphoræ gr. xv. inspers. lat. sinistr. May 11th : tongue is decidedly of better appearance, is moister and less irritative-looking ; gums not sore ; gains strength ; takes a boiled chop now for dinner. Pt. in pil., tantum *bis die*. 25th : improves. Tongue gets more natural, but slowly. Pt. in pil., *bis die* ; Ol. Morr. ʒij., *ter die*. June 8th : is very much better ; has taken the oil and found benefit from it, but not quite ʒij. for a dose. She has taken the pills only 1 week. Has a little uneasiness now and then after eating ; more since she left off the pills. Tongue looks again rather red and denuded. Is much stronger. Pulse, 96. Skin, natural. Pt. in pil. et oleo. 19th : tongue improves certainly. Still feels some pain in left side ; wishes to have the plaster renewed. Gets stronger, and has very good appetite, but finds it depends much on what she takes, whether it lies heavy or not. Pt. in pil., *o. n.*, et in oleo., Acidi Lactici, m. xv., Aquæ ʒss., *ter die*, c. cibis. 29th : feels very much better indeed. Pt. in omnibus. July 20th : is now quite well, quite lost the pain in side, and takes food comfortably and well. Has had no medicine for 14 days. Catamenia, regular. Tongue, still more denuded than natural.

In this instance mental uneasiness seems, very probably, to have been the original cause of the attack, but its recurrence and its aggravations were manifestly owing to catarrhal influences. A simply seda-

tive treatment at first produced great improvement, but afterwards, when a more inflammatory condition was established, it failed. Blistering was of no use. Bismuth allayed the irritation, but it was the mercurial treatment that effectually controlled the persistent inflammatory or erythematous action. On two occasions, when it was omitted for a time accidentally, the symptoms showed a tendency to recur. It is worth remarking how the strength improved while she was taking the mercurial, and how she was able to take the cod-liver oil with benefit, which before the stomach had rejected. The opium did not confine the bowels. Great benefit was produced by the lactic acid. I doubt that I should have been able to have brought the case to a satisfactory close without it. In the case of a man *æt.* 27, who suffered with a similar affection, it was equally serviceable. The patient, though a young female, was thoroughly honest: there was no indication of hysteria. The case is a long one, but I have thought it worth citing *in extenso*, as to bring a complaint of this kind to the desired conclusion, under the disadvantages of mere extern hospital attendance, is, I really think, a proof of what medicine can do. The rest and the discipline within the walls of a hospital are so potent for good in many cases, that it is not always certain what share medicine has had in the cure. A visit to the out-patient rooms of British hospitals might have some influence, I think, even on a Viennese sceptic.*

* The pathological condition of the stomach, ably described by Dr. Hamilton Roe, in the following communication with which he has favoured me, seems to be similar, if not identical, with that mentioned in the text.

The symptoms observed are—pain, varying in intensity, from a considerable degree of uneasiness to violent suffering, occurring immediately on

The next case is an illustration of a condition which seems to be in some respects the opposite of the foregoing. There is much less acute sensibility, and no hyperæmia, except passive, but simply debility of the stomach, which is unable properly to fulfil its digestive function. The general symptoms are those of failing power in the system, languor, and more or less of nervous disorder.

Case 48.—Ann F., æt. 44, admitted May 25th. She stated that she had been ill for 4 years with abundant leucorrhœa, but that she very seldom had pain in the left side. She complained of pain, extending from the loins down to the extremity of the sacrum. Had much pain at stomach after taking anything, and much flatulence. She had no appetite,

the introduction of food into the stomach, relieved three or four hours after eating by eructations of wind, but never entirely absent. Considerable distension, in the epigastric and left hypochondriac regions, is nearly constant. The tongue is not specially altered; usually thinly coated. There is no febrile excitement. Vomiting is not a frequent symptom, nor local tenderness. The urine is generally scanty, and loaded with red or pale lithates. Bowels are generally costive; but the stomach pain is not at all relieved by purging. The appetite is good, rather apt to be craving, with sense of sinking some hours after eating. Much more pain is experienced after solid food than light. There is not much thirst. The palms of the hands are dry. After the morbid state has continued some time, considerable emaciation takes place; but it has no connexion with phthisis.

The following treatment is found to be very successful. The diet is restricted, for 3 days, to arrowroot made with water; after that, a very gradual return to more substantial aliment is allowed, everything being avoided which causes pain to the stomach. The following pill is given three times a day:—Hydr. Chloridi gr. fs., Opii gr. fs., Aloes gr. fs., Camphoræ gr. i. Blisters and leeches are also found to be useful. The pills are gradually discontinued, and no other medicine is often found to be necessary.

The most important part of the treatment, next to the dieting, is the calomel and opium; the benefit produced by these remedies, as also by leeches and blisters, shows, I think, pretty clearly that the pathological state is one of subacute inflammation, the hyperæmia not relieving itself by mucous and watery exudation, as in other forms of catarrh, in which vomiting of such matters is a frequent occurrence.

and experienced a low, sinking feeling at the epigastrium. Tongue was indented and dryish. She complained of much bearing-down pain. The uterus was found normal, except that its anterior lip was elongated, and its posterior a little rough; it lay low in the pelvis. I desired her to use an astringent injection of zinc and alum, night and morning, to take Acid. Tann. gr. iij., Extr. Hyoscy. gr. i., *ter die*; and Acid. Nitric. m. iij., Acid. Hydrocy. Dil. m. v., Infus. Cascarill. ʒi., *ter die*. She was also to apply a pitch-plaster to the loins. June 8th: she said the pills made her feel faint, and searched her. The mixture was beneficial. She had less pain after food. Was dreadfully nervous. I continued the mixture, and gave her besides Camphor. gr. i., Extr. Hyoscy. gr. ij., *ter die*, instead of the tannic acid. June 15th: she was very weak and poorly, no better. I then gave her only Liq. Pepsini ʒi., *ter die*, with meals. June 22nd: she was much better, "appetite and all seem better." She found she could not take ʒi. at first, but took ʒss., afterwards she took the full quantity. She felt that it did her good. Said that she ate as hearty, and as well as she had for 12 months, and without pain. I desired her to continue the same remedy, but have not seen her since, from which it is tolerably certain she found she did not want more medicine. There was a very sufficient cause of debility in this case, in the leucorrhœal discharge. The stomach was distressed, but evidently far less irritable than in some of the former examples. The general relaxation of the frame was indicated by the condition of the uterus. The failure of sedatives, though combined with astringents and tonics, and the immediate good effect

of a powerful peptic aiding the weak stomach, differentiate this state very strongly from those where irritation predominates. With sufficient rest and tonics these cases are easily cured.

Dr. Copland, Art. Stomach, c. 29 of his Dictionary, allows that Rheumatism may be the sole exciting cause of gastric inflammation, the latter occurring without suppression or retrocession of the disease in other parts. Of this not very common occurrence, the following case is a good instance. Case 49.—W. D., æt. 43, Carpenter, admitted July 3rd. Is subject to rheumatism. Ill 2 months; his illness commenced with pain about the umbilicus; the pain now extends over his chest, and passes through to his back; it gets worse after taking food, but is relieved after vomiting has taken place. This occurs so constantly that he can keep no food on his stomach. He has been vomiting in this way about 14 days. There is no epigastric tenderness. Bowels costive. Urine clear and free. Tongue white, tip red. Seldom is thirsty. Very little appetite. Pulse small, not weak. Skin cool. Sleeps well. Has had no rheumatism for nearly a year, has had it in the chest before. He said that he had taken much Iodide of Potassium. I gave him Potassii Iodidi gr. iij., Ammon. Muriat. gr. xv., Vin. Colchici m. v., Inf. Gent. Co. ʒi., Tr. Opii m. iv., *ter die*. Blue pill and Colocynth gr. x., *alt. noct.* July 10th: has only vomited once. Urine clear. Tongue quite natural. Chest nearly free from pain. Bowels confined. Pt. Mist. Sennæ c. Tr. Aloes ʒi. *alt. auroris*. Warm bath occasionally. 17th: is very much better. Has no sickness; has gone to his work again; feels pain in the chest, and through to the back when

he gets tired, and then only. Bowels more regular. Appetite very good indeed; food digests now without inconvenience. Pt. in Mist. c. Tr. Cinchon. $\mathfrak{z}\mathfrak{i}$., et omifs. Tr. Opii. Pt. in Mist. Aper. July 31st: he continues at his work, his digestion is all right, and he may be considered well.

The influence of treatment directed to meet the rheumatic poison, was here very apparent.

Case 50.—A. H., æt. 38, healthy looking, children's Nurse. October 5th: Skin cool. Pulse of moderate force, quite quick. Bowels open. Last 2 days has felt a pain across the middle or upper part of sternum, which is increased at the time of swallowing any hard morsel, but not by warm liquids; the pain is worse also on lying down at night. Has slept badly the last two nights, with dreams and starting. Has suffered with rheumatic face-ach and slight pains in the joints. Had yesterday some pain down left arm. Has sensation of nausea, and as if cold water were lying at the stomach, but no pain during digestion of food. Voice is weaker than ordinary. She was ordered Camph. gr. i., Quin. Disulph. gr. ij., Acid. Tann. gr. iv., *bis die*; and Pot. Iod. gr. i., ex. Tr. Cinch. $\mathfrak{z}\mathfrak{i}$., *ter die*. Linim. Ammon. c. Opio ad thoracem. 7th: she had much pain in the chest yesterday, in swallowing; this was not relieved by Cat. Sinapis. Last night she suffered much from pain, evidently rheumatic, affecting the muscles of the back and shoulders, so that inspiration was painful. Soon after getting into bed, a shivering fit came on, and she has now shivering sensations if she gets out of bed.

The pain subsided this morning, after taking a cup of cocoa, very much, so that she can now breathe freely.

The lung sounds are natural. There is a systolic basic blowing murmur, and an occasional crepitus which appeared to me to be produced in the anterior mediastinum. Urine clear, but moderately acid, in good quantity. Bowels, open ; motions, quite healthy. When she swallows a little bread, she feels as if it did not pass down into the stomach, but it does not give so much pain as before. Calomel. gr. iij., Opii gr. i., were given this morning, and m. x. of Liq. Opii Sed., and she afterwards had some doses of a diaphoretic saline. At night she took gr. xij. Pulv. Doveri, and slept well. Three mustard poultices were applied during the day. 8th : the pain on swallowing has disappeared, but is felt more in the region of the stomach ; there is, however, no pain on pressure. She says that when she brings up wind from the stomach, she has pain in the same place where she used to feel it on swallowing. Appetite bad. Some thirst. Tongue clean. I then gave her Liq. Ammon. Acet. ʒiij., Ammon. Muriat. gr. xv., Vin. Colch. m. vi., Aquæ ʒv., *ter die*. 9th : was relieved after the first dose of the medicine ; “ it moved the pain about her stomach,” so that she now feels quite well. I gave her afterwards the Muriate of Ammonia, with Bark and Cascarella, and after some more manifestations of rheumatism in the legs, especially the calves, in the right thumb, and left forearm, and once, when the medicine was omitted for 2 days, in the stomach also, she recovered perfectly, and has continued well since.

The chief points in this case are the occurrence of a rheumatic affection of the œsophagus and stomach, and its speedy relief and cure by the remedy found to be so appropriate to muscular rheumatism. I

suspected the rheumatic character of the pain from the first, but the Iod. Potass. which I gave failed. English practitioners are much indebted to Dr. Fuller for drawing attention particularly to the great value of this remedy (Muriate of Ammonia) in muscular rheumatism. It is specially suited to this form, as the Iodide of Potassium is to the periosteal.

As far as my experience has extended, rheumatism is rarely met with limited to the stomach, and not affecting its usual haunts. It is very common to find ordinary rheumatism, mostly of the chronic kind, associated with dyspepsia, but I have not seen anything to convince me that in these cases the dyspepsia was rheumatic. I have rather been inclined to regard the mal-performance of the function of the stomach, as a cause of the rheumatism. I have notes of one interesting case, in which treatment directed to the stomach effected a complete, though not permanent, cure of rheumatic pain and muscular weakness, which completely disabled the patient from work.

In Andral's *Clinique Médicale*, p. 880, 881, of Dr. Spillan's translation, two most interesting cases are recorded in which gastric disorder of the severest kind, with extreme emaciation and debility, was arrested, and the patients restored to perfect health by the ordinary means used for the cure of syphilis. In the first of these cases there was no other venereal symptom present, except an ulcer on the posterior wall of the pharynx. That the bronchial membrane, on the pulmonary vesicular tissue, may be inflamed or congested from the localization of the syphilitic poison is now well known; but less mention has been made, so far as I know, of the liability of the gastric

to suffer from the same cause. The following case affords an instance of this.

Case 51.—H. G., æt. 38, Shoemaker, admitted April 4th. Has an eruption appearing rather like eczema on the face, scalp, and thighs. Complains of soreness and oppression at the epigastrium and lower sternal region, increased by food. Has much flatulence after meals. Appetite indifferent. Tongue rather white, and flabby. Has pains occasionally in the shoulders and the right wrist. Throat sore, has much pain in swallowing. Urine very dark, red, and thick. Bowels open. Potassii Iodidi gr. iij., Liq. Potass. m. xxv., Extr. Sarzæ ʒi., Inf. Gent. Co. ʒi., *ter die*; Garg. Aluminis. 11th: the oppression at the epigastrium is much relieved, can take food a great deal better. Tongue moist, clean. Urine clearer. The eruption is diminishing on some parts, but increasing on the face. Pt. in Mist. c. Pot. Iod. gr. v. 18th: spots are dying off, has much better appetite; pain is felt in globus major of left testis. The epididymitis had disappeared by May 9th, but then the gastric disorder returned; it continued till May 30th, and was accompanied with troublesome morning cough. The dyspepsia and the cough both disappeared, as well as an intercurrent attack of iritis, under mild mercurial treatment, together with Iod. Potass., by July 11th, when the report was that he was very much better, quite himself, feels quite well and can eat and drink heartily; eruption fading. I gave him then Hydr. Iodidi gr. i., *o. n.*, alone, hoping by a steady maintenance of the alterative action to eradicate the syphilitic taint. Aug. 1st: he said he was as strong and hearty as ever; but immediately

afterwards a bad attack of iritis came on, and as his attendance became irregular, my hopes of a complete cure vanished. The stomach irritation yielded at first to Iodide of Potassium, when it recurred it was only subdued by mercurialization. The like may be observed with other symptoms also. Mr. Spencer Wells observes very justly "that he has often had grounds for his belief, that latent syphilis was the real, though unsuspected cause of many diseases called by other names." Dr. Goolden has taken up a similar position, and illustrated it excellently with regard to rheumatism. Certainly in all cases of obscure disease we should never leave out of consideration the possibility of their being dependent on one or other of these most widely spread influences. The tendency of gout to affect the stomach is well known, both primarily and by retrocession.

In the chapter on the pathology of the stomach, *vide* Case 4, notice has been taken of the influence of the liver on the stomach, in producing congestion of its vessels, and vomiting often of bloody matters. The two following cases illustrate this point, and the treatment which has been found successful.

Case 52.—A lady, *æt.* 30, of delicate constitution, and anæmic, had always weak digestive powers, and had suffered on several occasions from what were called bilious attacks. About two months after her marriage, she had an attack more severe than any before. The stools were very unnatural, and contained no healthy bile; there was constant nausea, and violent retching, so that scarce anything could be kept on the stomach. No blood was rejected, as well as I remember, only a watery mucus. The prostration

and distress became really alarming. Repeated full doses of calomel were administered, and the nausea and vomiting were at last arrested, but not until the gums were slightly affected. The only thing that quieted the stomach in some degree, until the calomel produced its beneficial effect, was Ol. Menth. Pip., taken in warm water, with a little carbonate of soda. The unhealthy character of the evacuations, manifestly containing no healthy bile, though they were not clayey, was the ground of the diagnosis that the liver was essentially in fault. Since this attack, there have been none of anything like the same degree of severity; but I have frequently observed an unhealthy condition of the evacuations, coinciding with disorder of the stomach. The motions become either clayey, or of a dirty brown, offensive, and containing sometimes abnormal mucus. The symptoms consist in loss of appetite, aversion especially to meat and fatty substances, a dirty taste in the mouth, and a feeling of irritability.

Case 53.—Jane D., æt. 40, female, single, admitted March 13th. She was tall, and rather thin, of sallow aspect, with a dark tinge under the eyes. She stated that she had had hæmatemesis, to the amount of Oij. 1 year ago, and that she had suffered from indigestion for years. She was now ill for 14 days; complained of pain in the left side, passing through to the epigastrium, increased by food. The appetite was almost lost. Tongue was extremely coated. There was great epigastric tenderness. Urine was very dark. She was a Cook, and was much confined to the house. I gave her Calomel. gr. ij., for three consecutive nights, a blister to the epigastrium, and Mist. Salin. ℥i., Magnes. Sulph. ʒfs., Liq. Taraxaci ʒi., Acid. Hydrocy.

Dil. m. iv., *ter die*. On the 16th, this mixture was changed for Acid. Nitro-Muriat. m. v., Aquæ ℥i., *ter die*; and she took small doses of blue pill, with Taraxacum, or Colocynth, every night. She improved a good deal; the urine became much clearer; but, on the 23rd, she stated that pain came on again yesterday in the region of the stomach: it was much aggravated by food. Tongue coated at back. Bowels not well open. I repeated the blister to the epigastrium, gave her Calomel. gr. ij., *o. alt. n.*, and Mist. Sennæ ℥i., Tr. Aloes ℥i., *auroris sequentibus*, and continued the acid mixture. April 6th: she was much better in health, but had not quite lost the pain in the left side. Tongue was still furred at back. She took food well. 13th: she was improving. I changed the water of the acid mixture for Liq. Tarax. ℥i., Inf. Cascarill. ℥i. May 4th: she was a great deal better. Tongue cleaner, but still yellowish at the base; had very little pain in left side. Said she was better than she had been for 2 years. May 25th: I discharged her, as she was able to do her work in a situation. She declared that she had no pain at all, and took her food very well. There is not quite absolute certainty that there was no ulceration of the stomach in the latter of these two cases, and that this may not have been the cause of the copious hæmatemesis in the previous year. However, I think the kind of treatment employed, and its results, show clearly that the cause of the stomach disorder, on the last occasion, was functional derangement of the liver, and I strongly incline to the opinion that the same was the exciting cause of the hæmatemesis. As she improved, she took the calomel and purgative less frequently; but it was remarkable how slowly the tongue

cleaned. The dark condition of the urine, as well as the coated tongue, and the general aspect, indicated clearly the liver as the primary seat of disease.

The following case is the only one which has come under my notice, where the symptoms were of such a character as to indicate more than an inflammation of the surface layer of the gastric mucous membrane. I think the deeper tissues must also have been involved, and that the case may be cited as an instance of sub-acute gastritis. Case 54.—John W., æt. 54, a Butcher, who had failed in his business, was admitted under my care, March 30th. He had been ill 1 month, complained of pain in and about the situation of the gall bladder, which was increased on pressure. His food digested very badly, the pain was increased by food. About 1 hour after eating vomiting comes on, which relieves him. The matters vomited are of a brown-red colour. He feels often as if he wanted to be sick, and retches much. Has seldom any thirst. Pulse quiet. Skin cool. Bowels sometimes relaxed, sometimes costive. Suffers much more when bowels are confined. Is always better when stomach is empty. Tongue whitish, indented. Liver not enlarged. Heart normal. His abdomen swells much in the course of the day. Has lost flesh. Urine of a very dark yellow colour. From the absence of pyrexia I thought it possible that the inflammatory action might be reduced by astringents, and therefore gave him Acid. Tannic. gr. iij., Argenti Nitratis gr. $\frac{3}{4}$., Opii gr. fs., *ter die*; et Mist. Mucilag. $\frac{3}{4}$ fs., Acidi Hydrocy. Dil. m. v., Sodæ Carb. gr. v., *quater die*; and I applied a blister to the epigastrium. April 3rd: no more sickness, but much nausea; motions very dark. In order

to try the effect of purgation, I gave him Calomel. gr. iij., *hâc et alt. nocte*; et Sodæ Pot. Tart. zij., ex Aquæ zij., *bis die*. Pt. in pil. April 6th: urine quite clear and natural. Bowels open this morning, stools of natural colour. Tongue coated. Pulse perfectly quiet. Complains of extreme pain at the epigastrium, a great deal worse after taking food. Has had much nausea. He says he is no better, but he had a much better night after the first pill. I now determined to mercurialize him, as I saw the disorder was deeply seated. I gave him Cal. gr. ijfs., Opii. gr. $\frac{1}{4}$., *ter die*, and a Senna purge every morning. April 8th: mouth sore, pain much relieved, epigastrium much less tender, less feeling of weight there. Says he can *talk* much easier than he could. Bowels open once a day. Tongue white and moist. Wishing to continue the beneficial action of the Calomel, I desired him to take one pill every night, to continue the aperient, and to take Mist. Salin. ʒi. , Acidi Hydrocy. Dil. m. v., *ter die*. 10th: mouth very sore, bowels disordered, tenesmus, motions very green, with a mixture of red. Has acute pain in the right side, attended with violent retching. Seeing that the Calomel had produced too much effect, and had set up dysentery, I omitted it altogether, gave him Pulv. Doveri gr. x., *ter die*, and applied 6 leeches to the painful part. April 13th: he feels better. Bowels act regularly, not relaxed. Pain in side a great deal easier, leeches gave great relief. Is very nervous. Tongue white, moist. Pulse soft, quick. Argenti Nitratis gr. fs., Extr. Hyoscyami gr. ifs., *ter die*. Mist. Ammon. Acet. ʒi. , Pot. Nitrat. gr. x., Tr. Hyoscy. m. xv., *ter die*. 17th: is a great deal better, but mouth is ulcerated extensively, from the effects

of the Calomel. He feels "as if he could eat anything if his mouth would let him." Pulse 84, of good force. Pain, when it comes on, is higher up; more in the chest than it was. Pt. in pil. and Mist.; Pulv. Alumin. Exsicc. *pro ore*. 27th: "is quite a new man, as well as ever he felt in his life." "The organs of digestion have altered altogether." "Is voracious, nothing comes amiss to him." Has sometimes a slight pain in the old place. He was profuse in his expressions of gratitude. I desired him to continue the pills a little longer, but have not seen him since. He resided at a distance, and probably thought it unnecessary to come again. The severe inflammatory action in this case was evidenced by pain, tenderness on pressure, increase of pain after food, and vomiting, the bloody appearance of the vomited matter, and the sense of oppression and weight at the epigastrium. To these signs may be added the failure of astringents and sedatives, and of a blister. Purgation did not produce any decided benefit, but the action of mercury on the system gave decided and immediate relief. This was not prevented by the unusual susceptibility of his system to the influence of this mineral, which gave rise to rather severe dysenteric symptoms. After these had subsided the nitrate of silver, which had failed previously, came in with the best effect;—another instance of what may be sometimes observed in the use of this agent, viz., that it aggravates active inflammation, but rapidly reduces it when the active stage is gone by. Dr. Hunt, in his excellent treatise on indigestion, a work abounding with judicious and sound views, and valuable precepts, recommends the employment of mercurial alteratives in cases of, what he calls,

“inflammatory dyspepsia,” in order to remove “the effused lymph and other products of the inflammatory action.” He says “it is seldom advisable to induce a decided constitutional influence of this drug, although I have observed in several cases, when this has accidentally occurred, the relief has been greater and more permanent than, there is reason to believe, would have been afforded, had not such an effect been produced.” I am not touching here the question of the administration of mercury in cases of a more chronic kind, whence, as Dr. Hunt states, the morbid action may have caused obliteration of the vessels and ducts, but I am glad to be able to adduce the testimony of one, whose opinion must be of much weight, in favour of the practice of giving mercury, so as to affect the the system, in cases of deep-seated gastric inflammation. Dr. Copland scarcely makes mention of this mode of treatment, and then only partially, and in reference to chronic gastritis. Dr. Budd does not allude to it at all in his Lectures. I am not, of course, advocating the indiscriminate administration of mercury in all cases or stages even of severe gastritis. I am sure it is a weapon, most potent, for good or ill, and I think, in no case ought it to be prescribed without a thorough appreciation both of the existing pathological condition, and the state of the general system. It is a marvel to me that such a question can be proposed as that which we have heard, viz., Whether mercury should be used in pericarditis? Surely everything should depend on the state of the patient’s system, and the nature of the exudation which is poured out, so far as we can form any opinion about it. In an unbroken constitution,

when, it may be presumed, the exudation consists of healthy fibrine, mercury will, beyond doubt, be of use. It will liquefy the exudation, and render it capable of being absorbed. But in a broken-down system, with diseased kidneys, when the exudation probably consists of corpuscular fibrine, or of sero-purulent fluid, there is no place for the beneficial action of mercury; it will but depress the feeble powers and hasten death. In pleuritis it is just the same, every practitioner, almost, has met with cases where effusion has rapidly cleared away under prompt mercurialization; but, as Dr. Sibson has particularly remarked lately, there are many cases of extensive effusion where mercury is only injurious, and the free employment of opium, gr. i., every 4 or 6 hours, is the best treatment. Ophthalmic disease affords most beautiful instances of mercurial action, and of the absolute need to adapt it skilfully to the state of the system. In sthenic iritis we all know how the lymph vanishes under the action of calomel or blue pill. In keratitis the interstitial effusion between the laminæ of the cornea disappears, often promptly, under the use of gray powder. If, however, the disease, in either case, be asthenic the mercury alone will do harm, it must be given in conjunction with tonics. This important circumstance was most thoroughly appreciated by the late Mr. Tyrrell, and is expounded in his work, in a most interesting and instructive manner. I know no such lessons in general pathology as those which the Student may find in his invaluable pages. The reader will, I trust, excuse this digression on account of the great importance of the point in question, and its frequent recurrence in practice.

Having considered, under the head of pathology, several of the phenomena attending upon ulceration of the stomach, I shall confine myself here to giving some account of three cases, in which there is strong ground for believing that this condition existed, and which were considerably benefited by treatment. The first of these has been kindly communicated to me by my valued friend and colleague, Dr. Sieveking.

Case 55.—Eliz. P., æt. 27, a tall, robust girl, with a florid complexion, was under my care, at St. Mary's Hospital, during the greater part of 1853. She had previously been a patient of mine, with dyspepsia, accompanied by severe pain on taking food, which had rapidly yielded to the employment of an oleaginous mixture, with hydrocyanic acid, and abstinence from all stimulating articles of diet. The symptoms returned, with great violence, after the lapse of a few months; there was intense pain after food, and extreme tenderness at the epigastrium, but comparative ease when the stomach was not required to perform any duties. All counter-irritants externally, and sedatives internally, accompanied by rigid attention to diet, which consisted of farinaceous articles and milk, failed to afford more than slight relief. An attempt, made at the suggestion of a friend, to treat it as hysterical, and give steel, aggravated the symptoms so much as to discard that view entirely. Vomiting, with some hæmatemesis supervened. There was no other derangement, except some functional palpitation. I then had recourse to astringents, viz., tannic and nitric acids; and, under a steady employment of these remedies, a complete cure was effected. The patient was not discharged as cured until she had been for

some time able to take the ordinary diet of a servant with impunity. The cure took place, in spite of the great disadvantage of constant exertion — circumstances not permitting the girl to give up work. She enjoyed good health and freedom from pain for nearly a year, when the epigastric pain returned. It was almost continuous and oppressive, worst in the morning and after eating; but not so severe as formerly. It was preceded by cough and expectoration. The right tonsil was enlarged; there was much mucus in the pharynx; Cat. regular. Pulse 72. She did not come to the hospital more than a few times, so that it seems probable this attack was of brief duration, and not accompanied by actual ulceration.*

Case 56.—Frances P., æt. 33, female, married, admitted February 16th. Is always ailing; subject to colds; ill now 10 weeks. Had hæmatemesis about Christmas; much sickness was felt before the blood came up. Has pain across the epigastrium; not worse after eating; but finds that heavy articles of food do not digest well. The epigastrium is tender to pressure, but there is no tumour or any enlargement to be felt; the muscles, however, are very tense. Tongue indented, whitish. Bowels rather costive. Cat. regular. Aspect anæmic and unhappy. Is rather deaf. Empl. Lyttæ, 3 × 4, *epigast.* Acidi Tannici gr. iij., Extr. Hyoscy. gr. i., *ter die*; and Acid. Hydrocy. Dil. m. v., Mist. Mucilag. ʒss., *ter die*. Ol. Morr. ʒij., *ter die*. She was desired to take 3 plain meals a-day, at intervals of 5 hours, with exercise regularly before the mid-day meal. March 9th: she had continued the

* Dr. Sieveking informs me that he had no doubt of the existence of ulceration in this case.

remedies, and repeated the blister once. She feels a good deal better in herself; had "nothing of the pain in the chest to what she had." Can go about a great deal better. Repetatur Empl. Lyttæ et alia. On the 23rd she was worse, from the effects of a catarrhal attack; but she had no pain after eating. I continued the pills and the oil, and gave her Acid. Muriat. m. iij., Acid. Hydrocy. Dil. m. iv., Aquæ ʒi., *ter die*. April 3rd: getting on much better; is stronger; feels no inconvenience in digesting food; takes meat comfortably; "her friends hardly knew her yesterday." She continued under my observation till May 15th, when I discharged her, as she appeared tolerably well, though complaining of some minor ailments. On May 1st she stated that she was getting stronger, took food well, and felt nothing of the indigestion; but had much pain, occasionally sharp, in the left side; this was probably neuralgic. Quinine had latterly been substituted for the acid mixture.

Case 57.—Louisa B., æt. 23, single, Dressmaker. Admitted under my care August 12th. Extremely anæmic, rather short, and broad made, not hysterical, much marked by variola, which she had at the age of eight. At Christmas, 1853, she was very ill, with an attack of bronchitis, and perhaps pneumonia, and was in great poverty. She was then three weeks in St. Mary's Hospital. After leaving the house, she remained tolerably well till June, when she was attacked by her present illness. She states, that she has not been quite well for three or four years, being languid and ailing. Before the present attack, her digestion was very tolerably good. Towards the end of June she felt faint one day while in the house, and went

out into the yard for air; while there, she leaned on a tub, and soon after fainted, and lost all consciousness. She was found with the tub lying on her, and was brought into the house, and immediately after vomited more than a pint of blood. No blood has been brought up since, but her digestion has been much impaired; she has felt pain after eating, of a gnawing character, and the food has lain heavy. Diarrhœa has occurred, which was not stopped by Dover's Powder, but has now ceased. Tongue pale, clean. Pulse 120, full. Skin warm. Bowels regular. Catamenia regular. I desired her to take three light meals a-day, at the hours of 8 a. m., 1 and 6 p. m., and no other food; and gave her Acid. Tannic. gr. iij., Arg. Nitr. gr. fs., Opii gr. fs., *ter die*; with Mist. Mucilag. ʒfs., Tr. Opii m. v., Acidi Hydrocy. Dil. m. iv., *quater die*; and applied Empl. Picis *epigast.* On the 17th she is reported much better; the bowels had been rather loose for three days, and she had passed each time a very little blood. The next week she began to take Ol. Morr. ʒfs., *ter die*. By the 30th she was able to take food well, and did not feel uneasy after it; there was some diarrhœa, attended with pain. I continued the pill and oil, and gave her Tr. Ferri Mur. m. x., Acidi Muriat. m. ij., Aquæ ʒfs., *ter die*. There was some difficulty for a short time in getting the stomach to bear the oil and steel, but, by a little management, taking the medicines less often, this was overcome. September 21st: she reported that she took the oil and mixture well, was getting quite strong, and had no pain in stomach. She had been eating, the week before, boiled mutton, rice, and arrowroot. 28th: diarrhœa had recurred. Tongue whitish, and glazy. I conti-

nued the oil and mixture, and changed the Tannic acid of the pill for two grains of Quinine. From this time she proceeded quite steadily improving, her digestion quite comfortable, and her strength increasing, till November 16th, when she appeared so far recovered, and looked and felt so well, that I thought she might be discharged. She said she had not the least uneasiness about the stomach, and had not been so well for three or four years. Her friends' impression was, that she had been rescued from the grave, so marked was the change that had taken place in her state. From the history of this case it is very clear, 1st, that the treatment adopted did not offend or injure the suffering organ; and 2nd, that the general health was greatly improved. Whether the ulcer was healed or not, I cannot tell, but I am sure it was placed in circumstances favourable to repair.

These three cases were treated in nearly the same way, and in all very marked improvement took place. The object which I had mainly in view, in my cases, was to improve the general nutrition, and therewith that of the gastric mucous membrane, by analeptic and tonic treatment. It seems very certain that ulceration of the stomach, however much it may be affected by local conditions, is primarily occasioned by some defect in the assimilative power of the tissue; and it is reasonable to suppose, that means which invigorate the part will expedite its repair. Nitric acid is a very good application as a wash to ulcers of the skin, and tends, unquestionably, to induce a healthy action. Tannic acid is an excellent astringent, and avails, certainly, to check any unhealthy mucous profluvium, and to maintain a due tone in the capil-

lary system. The influence of cod-liver oil in promoting healthy nutrition, generally, is familiar to all. Why, then, should not these or like means be used in the treatment of cases where there is but too much ground to fear that ulceration exists? Dr. Budd relies chiefly on a farinaceous diet, and there can be no question that this may be of great importance, and, as in cases he has quoted, may be sufficient to obtain the cure of gastric ulcers. There will, however, constantly be cases coming before us, where the symptoms are not so clear as to make it possible to enforce this restriction, and, moreover, when sufficient rest cannot be had, it is a question whether a more nutritious diet may not be of more benefit. No change in the diet will prevent the formation of acid chyme, and I should attach more importance to the leaving sufficiently long intervals between meal and meal, so that the stomach may have a good resting-time after digestion is over, than to the administration of ingesta, which we may suppose to be less irritating to the ulcer than others. Certainly, the *frequent* taking even of the lightest articles of diet must cause some secretion of gastric juice, and so prevent the stomach having, what is so essential, periods of complete repose. It is to be remembered that acid gastric juice is a normal and appropriate application, so to speak, to the mucous surface, just as acid urine is to that of the bladder; and I should think the existence of a catarrhal condition of the whole stomach, and the mal-performance of digestion, much more likely to interfere with healing of an ulcer than the contact of the healthy secretion would be. The object, therefore, of treatment would be to bring

the whole of the gastric tissue into as healthy a state as possible, to promote healthy digestion, and to raise and maintain the tone and vigour of the general system. In the fulfilment of the second indication, an hour's rest after each meal, with suitable peptic tonics administered with the food, as, for instance, m. xv. of lactic acid, would be of great importance.

Case 58.—J.H., æt. 58, suffered upwards of 20 years, with occasional attacks of pyrosis, and pain at the epigastrium, coming on an hour after meals, sometimes attended with vomiting. He was always observed to suffer most when in trouble and mentally depressed; at these times he would fast for a day or two. Three years previous to his death he vomited some matter, described as being like coffee-grounds, and partially coagulated. He suffered very much until within 18 months of his death, when business of a profitable nature took him to Madeira and back, twice in the space of 9 months; during this time being probably freer from anxiety and care, and perhaps living better than at any previous time of his life, he did not once suffer with his complaint. On his last return home, he appeared much younger, and was stout and well. This good state continued for some time, but as trouble again invaded him, so did his disease; he suffered loss of appetite and pain, which was relieved by vomiting. At length, when overwhelmed by pecuniary difficulties, he was seized in the street with violent pain and faintness, after which he survived only 48 hours.

On post-mortem examination an ulcer was found to involve nearly the whole circumference of the pylorus, and at the anterior part to have perforated all the

coats, leaving a hole the size of a fourpenny-piece, with smooth edges, as if cut with a punch. There was some thickening around the ulcer, but no appearance of scirrhus formation. The mucous membrane elsewhere appeared healthy. There were the usual results of recent peritonitis.

This interesting case, for which I am indebted to the kindness of my friend, Mr. Ballard, illustrates very well the beneficial effect of means capable of raising and invigorating the general power, though no restriction is laid upon the patient's diet. I think there is a very strong presumption that, had this person's circumstances continued favourable, his dyspepsia would not have returned, his gastric mucous membrane would have functioned properly, and the gastric ulcer would have healed.

There is a condition of the stomach which I am desirous to allude to, though it has not appeared to me to be of frequent occurrence. It partakes much of the character of neuralgia, but a still more prominent feature is the rejection of large quantities of highly acid fluid, which are thrown off either mixed with food or alone. Inflammation does not seem to form any part of the morbid action, which can scarcely be described otherwise than as a peculiar derangement, probably depending on a disordered innervation. An excellent illustrative case of simple neuralgic gastrodynia is quoted by Dr. Graves, from Dr. Corrigan, at p. 757 of his work (1st edit.); this was cured by Tr. Opii m. xv., administered at the time of one of the attacks. A similar case has been communicated to me by my friend, Mr. Ballard; the patient, a married woman, æt. 28, while suckling with a failing supply of milk,

was attacked by violent pains at the epigastrium, not increased by pressure or food. Tongue clean. Bowels regular. She was cured by 3fs. doses of Tr. Opii, smaller doses as well as aperients having failed.

The following case was manifestly unlike these.

Case 59.—O. R., æt. 50, a Lawyer of considerable repute, much occupied in business, has always had an irritable and weakly stomach. Though never intemperate, he has been rather prone to commit indiscretions in diet. During the last 6 years he has been subject to attacks of pain in the stomach, attended with distressing vomiting, emaciation, and weakness. He is now (January, 1853,) suffering from the most severe he has yet had. He is extremely emaciated, quite prostrate. Skin cool. Pulse 42, intermitting, feeble. The pain every now and then remits for 4 or 5 days, and the stomach remains pretty quiet, then pain and sickness return again. The paroxysms come on rather uncertainly, they cannot always be traced to the excitement of food, of which he only takes the mildest and lightest kind. Bowels obstinately constipated, evacuations when obtained very pale, hard, and dry. The action of the liver was manifestly arrested, yet there was no jaundice. There was no distension of the stomach, and the abdomen was quite fallen. Some tenderness was experienced near the region of the pylorus, where an enlargement is said to have been discovered some years ago. There is none now. The fluid vomited was very acid, and occasionally contained some *sarcinæ*, with more or less tenacious mucus entangling nuclei and cells from the tubes. Urine was alkaline, and deposited amorphous phosphates. Tongue was covered with a creamy fur.

Bismuth and Magnesia with Hydrocyanic acid at first afforded some temporary benefit. Blisters also appeared to be of some use. Nitrate of silver with Acid. Hydrocy. (Scheele's), in its turn, together with repeated doses of alkalies, was employed for some days with advantage, but no real ground appeared to be gained, and the emaciation and debility were alarming. On account of the presence of sarcinæ the Hypo-sulphite of Soda was given, and this either produced or coincided with a gradual amendment; small doses of Magnesia and Tr. Opii being also taken at times when attacks of pain came on. In spite of a troublesome diarrhœa, which was with difficulty controlled, he gradually regained health and flesh, and was able to walk about. After this attack he continued tolerably well for about 2 months, but early in June he again became ill. The action of the liver was completely disordered, the motions appearing clayey, and of a dirty greenish mud colour. Tongue white. Much oppression, nausea, and distress at stomach, especially in the beginning of the night. So marked, after some time, was the periodicity of the paroxysms, that Quinine was given shortly before the supervention of each, and with the effect of arresting them. Small doses of Calomel, administered daily, caused the evacuation of much unhealthy bilious matter, and with careful dieting he rallied again, and with the exception of a slight interruption in the end of September, he improved steadily, so that in July 1854, when I saw him on account of an attack of lumbago, he stated that he had been wonderfully well for the last year. He was stout and looked well. He was now free from pain or uneasiness about the epi-

gastrium, which he had felt, more or less, for 2 years. Instead of coming home to a late dinner, he was now in the habit of eating a light, sparing meal in the middle of the day, and making a substantial tea in the evening, and he appeared conscious that this régime was important to secure his continuing well. The utter disorder of the gastric functions in this case, during the time of the severe attack, was very striking. There was an abundant profluvium of highly acid, apparently normal, gastric juice, abundantly sufficient, one would have thought, to have digested anything; and yet scarce any digestion took place, and emaciation and debility proceeded to an alarming extent. Such was the draining away of acid, that the urine was left constantly alkaline; this was not from the presence of ammonia, but of fixed alkali. There was simultaneous disorder of the liver, but the symptoms were by no means those of secondary gastric disturbance from morbid action, originating in this part. There was no trace of gout, rheumatism, or syphilis. Nothing could be made out, though the case was seen by the most eminent physicians, beyond the manifest phenomena of gastric disorder, except the occasional presence of *sarcinæ*, which could only be viewed as an accident. After much reflection on the case, I could come to no other conclusion, than that an organ, naturally weak, and long harassed by irregularities in diet, and other causes of irritation, at length resented its maltreatment by perverted and abnormal action. It seemed, so to speak, as if a flux of gastric secretion took place, far more than would have been produced under normal conditions. The condition seems, in some measure, analogous to that of a weak, irritable heart,

which shows its weakness by excessive action, palpitating violently, yet ineffectually. The ordinary result would have been gastric catarrh, or an erythematic and irritable state of the mucous surface; but owing to a peculiarity of system, the morbid action assumed the form which has been described. There was nothing to indicate that ulceration existed, but even if such were the case, it would not account for the super-vention of the attacks, their peculiar character, and their complete subsidence. In the worst periods of the disease medicine seemed to have little power; most careful dieting, which was most ably carried out by Mr. Baker Brown, was apparently the most important thing to be attended to. At pp. 878, 879, of Spillan's translation of Andral's Clinique Médicale, there are two cases briefly recorded, in which, after severe palpitations of the heart, there came on obstinate attacks of vomiting, which reduced one patient to the verge of dissolution, and to an extreme state of emaciation. In both cases, as soon almost as the vomiting ceased, the power of digestion was completely restored, and they recovered rapidly. The tongue was natural, the epigastrium painless, and the pulse not frequent. Between these cases and the one above recorded, there is the analogy of the complete derangement in both of the functions of the stomach, without any inflammatory movement. Whatever be the exact nature of the vital chemistry which goes on in normal secretory action, it is certain that this, *per se*, is liable to perversion and derangement independent of inflammation.

In the following case, the affection was evidently a neurosis, though not resembling at all ordinary neuralgia. Case 60.—J. C., æt. 34, a Gardener, tall, of

large make, rather sanguine. Admitted August 7th. Stated, that he had been ill two or three months. Has pain at the epigastrium, passing through to back, not worse after eating, but relieved. It is of a sinking, "deadly" character. After eating, the stomach soon feels empty again. Has nausea, sometimes a sense of tightness across lower part of chest. Eyes clear. Urine clear. Is nervous, inclined to have palpitation. Heart's sounds weak. No evidence of emphysema of lungs. I gave him Quin. Disulph. gr. ij., Acidi Tannici gr. iij., Morph. Muriat. gr. $\frac{1}{4}$., *ter die*. He was directed to take three plain good meals a-day, at 8 a. m., 1 and 6 p. m., and no tea. 14th: "is more substantial in himself." Abdomen getting firm. Pain occurs in same parts occasionally. 31st: he had had some diarrhœa, which had ceased; "the pills," he said, "acted on him just as magic would have done." September 11th: "is quite a different person." September 18th: complains of pain under right scapula, passing through to right breast, with flushes of heat, and heaviness, referred to head. Bowels regular. Digestion good. Tongue clean. Is better for food. I continued the pills, and gave him, also, Mist. Quinæ $\mathfrak{z}$ i., Zinci Sulph. gr. ij., *ter die*. October 2nd: the zinc caused sickness at first, but he was soon able to take it well. He had improved nicely. Was free from pain. November 2nd: he was well enough to be discharged. This case seems to have been one of nervous debility, rather than of nervous pain (neuralgia) of the stomach. There was rather a simple defect of nervous power, than hyperæsthesia. The same difference may be recognized, I think, in other neurotic disorders; some

present the characters of erethysm and excitement, others of pure debility. The former have appeared to me more difficult of cure than the latter.

With respect to the cases which have been seen to be so common, where nuclear and fibroid formation is going on between the tubes of the stomach, the absence of reliable symptoms renders, of course, treatment a matter of great uncertainty. Dr. Hunt, as already mentioned, finds benefit from the administration of mercurials and iodide of potassium, in cases where inflammation has existed, and where he presumes the exudations of inflammation have taken place in the substance of the tissue. It will, I fear, be necessary to watch for opportunities of post-mortem examination of cases of this particular kind, before we shall surely know whether inflammation is essentially concerned in these textural changes. Certainly they seem to go on independently of it, even if, in all instances, they are initiated by it. However, if, as is most probable, this change belongs to the great ill-defined class of fibroid degenerations, which are in great measure characterized by the interstitial growth of low fibroid tissue; the two remedies which occur to my mind as the most likely to effect good, are, the Bichloride of Mercury, administered with or without bark, internally, and baths of the Kreuznach waters. With these, in most cases, cod-liver oil should be conjoined. Mr. Wilde's testimony, as to the beneficial effect of the bichloride, can be endorsed by many; and Dr. Prieger has lately brought forward a considerable body of evidence, to show the power of the Kreuznach waters in melting down and removing fibroid tumours of the uterus.

APPENDIX

RELATIVE TO THE PRESENCE OF HYDROCHLORIC ACID IN THE GASTRIC JUICE.

Although it is a very difficult matter to determine what all the acids are which are contained in the gastric juice, yet it appeared that some definite result might be obtained if a number of specimens of acid vomits were distilled, and the product examined for hydrochloric acid. The following table contains 20 observations made with the view of ascertaining how often, and in what kind of cases, this acid was present. The distilled fluid, in all the cases, was tested with nitrate of silver.

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| (1.) Female, operated on under chloroform. Vomit highly acid, apparently healthy, mixed with ingesta. | — Nitrate of Silver gave a precipitate. |
| (2.) Pig, healthy contents of stomach mixed with water, which became very acid. | — Very faint cloud. |
| (3.) Man, rheumatic, suffering from old stricture and extravasation of urine. Vomit dark red, highly acid. | — No perceptible cloud. |
| (4.) Rabbit, green vegetable contents of stomach mixed with water. | — Distillate very feebly acid, gave a very faint cloud. |
| (5.) Female, suffering under gastric ulcer, and chronic gastric catarrh. | — Distillate feebly acid, a barely perceptible cloud. |
| (6.) Same, after 7 weeks' interval in same state. | — Distillate feebly acid, extremely faint cloud from test, rather less than from common water. |
| (7.) Man, having had repeated attacks of hæmatemesis. Vomit fermenting and containing numerous sarcinæ. | — Distillate strongly acid, gives a barely perceptible clouding. |

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| (8.) Same, after 4 weeks' interval, same state. | — Distillate highly acid, gives a very faint precipitate. |
| (9.) Female, with rather severe gastric catarrh. | — Distillate pretty strongly acid, faintly clouded. |
| (10.) Man, gastric catarrh. Vomit viscid, very acid. | — Distillate not strongly acid, a barely perceptible cloud. |
| (11.) Man, vomiting from peritonitis, fluid acid, no food for 2 days. | — Distillate very slightly acid, no cloud. |
| (12.) Female, acute gastric catarrh. | — Distillate acid, no cloud at all. |
| (13.) Female, vomit of early pregnancy. | — Distillate strongly acid, scarce any cloud. |
| (14.) Man, in cholera. Vomit very clear and watery, strongly acid. | — Distillate gives a notable precipitate. |
| (15.) Female, ascites from cirrhosis, gastric catarrh, sarcinæ. Vomit acid. | — Distillate highly acid, not the least cloud. |
| (16.) Same, 16 days before. Vomit after dinner, it was clear, highly acid. | — Distillate faintly acid, no cloud, with Arg. Nitr. |
| (17.) Same, 34 days after first examination. Vomit contained blackish blood-tinged mucus, in which were numerous sarcinæ. Supernatant fluid clear, very acid. | — Distillate, both first and second portions, strongly acid, no cloud with Arg. Nitr. |
| (18.) Female, irritable stomach, vomiting after any food, no fever. Vomit highly acid. | — Distillate gave a faint cloud, redissolved by N. H. ₃ , not by N. O. ₅ . |
| (19.) Man, disordered stomach and liver, fasting 2 days, a sufferer from synovial rheumatism. An emetic of Ipecac. brought up highly acid vomit affecting the teeth. | — Distillate gave a dense precipitate with Arg. Nitr., insoluble in N. O. ₅ , soluble in N. H. ₃ . |
| (20.) Man, suffering from paroxysmal pain in stomach, nausea, and vomiting. Vomit clear, very high acid, not effervescing with chalk; residuum of distillation acid. | — 1st portion of distillate not acid, nor was 2nd; the 3rd was <i>alkaline</i> . The 1st gave no cloud, 2nd, a very faint one, 3rd, a slight. |

Three of these cases, the 1st, 14th, and 19th, gave notable precipitates evidencing the presence of hydrochloric acid in some quantity in the distilled fluid. In the 1st case the stomach may be presumed to have been healthy, in the 14th the patient was in severe cholera, in the 19th there was considerable gastric disorder. These cases, then, seem to have nothing in common. In 6 cases the 3rd, 11th, 12th, 15th, 16th, 17th, the distillate contained no hydrochloric acid. To these cases also there seems no particular condition com-

mon, only it may be remarked that the last three all refer to the same person. In all the remaining cases, including a healthy pig and rabbit, there was evidence of the presence of a very minute quantity of the above-mentioned acid in the distillate, yet there is nothing to give any hint why it should be so. The only conclusion which seems to me at all possible is, that in the distillate of acid gastric fluids hydrochloric acid may often be detected in minute quantities, sometimes in larger, and sometimes may be quite absent. But now comes a fresh perplexity. MM. Bernard and Barreswill have shown that lactic acid is capable of decomposing chlorides, and I have found, on making the experiment, that this is certainly the case. When lactic acid is distilled with a solution of common salt, the distilled fluid gives very manifest evidence of the presence of hydrochloric acid, and the vapour which rises from the boiling residuum is highly acid, contrasting strongly with the neutral vapour which is produced when a solution of lactic acid in water only is boiled. Hence, it appears, that we cannot conclude certainly that the hydrochloric acid exists in the gastric juice, because such is found in the distilled product. It becomes, therefore, exceedingly probable that in all the above cases, at least, where only slight traces of hydrochloric acid were observed in the distillate, this was actually formed by the decomposition of the common salt, or other chlorides present in the original fluid. I have often endeavoured to obtain evidence of the existence of lactic acid in the gastric juice by forming a lime salt, which crystallizes in a very characteristic manner, but the obstinate adhesion of the animal matter to the acid has always prevented me.

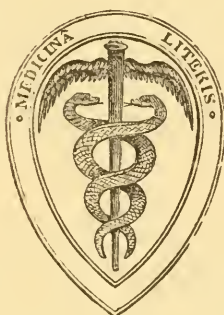
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